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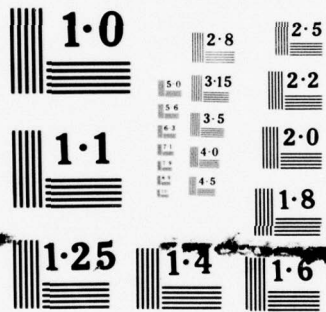
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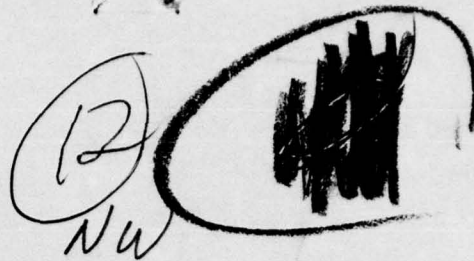




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TECHNICAL REPORT TD-77-11

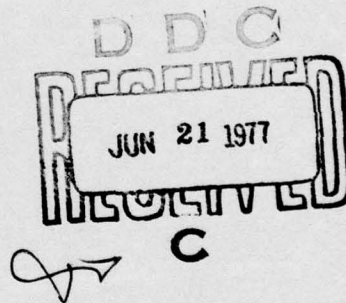


AN INVESTIGATION OF FLOW AND STABILITY CHARACTERISTICS
FOR A BODY OF REVOLUTION WITH FINS AND FLARE IN PRESENCE
OF PLUME INDUCED SEPARATION AT MACH NUMBERS 0.7 TO 1.4

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May 1977



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The results of a wind tunnel test, simulating rocket motor exhaust jet effects on missile aerodynamics at Mach numbers of 0.7 to 1.4 are presented. A normal jet plume simulator was used to induce afterbody boundary layer separation. Flow visualization techniques including both shadowgraph and oil flow photographs were taken. The primary emphasis for this report is the force and moment measurements taken on twelve configurations including: five tail fin configurations; body alone; → next page		

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three forward fin configurations; body flare combination; and two combinations of forward fins/strakes with tail fins. All force and moment coefficients are presented in plotted form. One configuration is shown with ground plane interference simulation.

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I. INTRODUCTION

The objective of this test was to study several techniques for improving static aerodynamic stability for missiles with large rocket motor plumes. Flow phenomena were recorded through both oil flow and shadowgraph for seven of the thirteen configurations that were tested during the force phase. This report documents primarily the data from the aerodynamic force measurement phase. Subsequent reports will include more detail analysis with data from the visualization phase. All testing was conducted in the Aerodynamic Wind Tunnel (IT) of the Arnold Engineering Development Center (AEDC) Propulsion Wind Tunnel Facility (PWT).

It has been shown (reference 1) that longitudinal location of fin stabilizers may be adjusted to improve aerodynamic stability for particular plume-missile configurations that have afterbody boundary layer flow separation. Location of fins forward of the missile body base may not be feasible in some cases, and it could further complicate the structural considerations of hardware design. The model for this test was designed so that aerodynamic stability could be studied for configurations with geometric modification to aft mounted fin stabilizers. These were: extended fin exposed span, fin body gap, and extended fin chord. Two additional configurations were introduced: strakes/fin-strake combinations and a forward mounted flare. All of these were covered in the thirteen configurations tested. A normal jet plume simulator was used to induce the afterbody boundary layer separation. One series of test throughout the Mach number range of 0.7 to 1.4 was conducted with a solid bottom tunnel wall replacing the normal perforated wall. This was implemented to provide nose bow shock reflections and/or ground plane interference effects on aerodynamic stability with plume simulated boundary layer separation.

II. APPARATUS

A. Test Facility Description and Operation.

The AEDC-PWT Aerodynamic Wind Tunnel (IT) is a continuous flow, non-return facility, with Mach number capability from 0.2 to 1.5. The tunnel total pressure is essentially nonvariant at approximately 2850 psfa with ± 5 percent variation. The total temperature variation can be controlled from 80 to 120 degree F. The test section is one foot square and 37.5 inches long with 6 percent porosity with all four perforated walls installed. During the visualization phase the sidewalls were replaced with solid transparent walls, and during the force test simulating ground plane interference the bottom wall was replaced with a solid floor. A more detailed description of the IT facility may be found in the AEDC Test Facility Handbook (reference 2).

B. Model

The model was a sting mounted body of revolution having a diameter of 1.1 in. It had a 3-caliber tangent ogive nose with a 7.4 caliber cylindrical afterbody, making a total length of 10.4 calibers (11.44 in.), figure 1. Five tail fins were added to give six arrangements of: two exposed span variations (F2, F5); three fin root chord body gaps (F5, F6, F7); two chord variations (F2, F8); and F2 rolled 45° to the "X" position. Three fins were mounted forward of the base; S1, S2 and F2. Fins S1 and S2 are referred to as "strakes" and are mounted with their trailing edge 1.5 calibers from the base. Fin F2 was mounted with the trailing edge 1.65 calibers from the base. Combinations of the small strake S1 and tail fins F5 and F7 were also tested. A truncated cone "flare" one caliber long was added with the flare base one caliber from

the body base. The flare height and the exposed span of strake S1 were made to be the estimated boundary layer thickness for the model in the 1T test section. Strake S2 was made to be two boundary layer thicknesses. Fin F2 and the body were made to be geometrically similar to previous models tested at CALSPAN, and AEDC, PWT 16T, reference 1. These configurations are shown in figure 1 and table I. Installation photographs of each of these are shown in figure 2. Many other arrangements are available with this model. The plume simulator is identified on the first of the photographs of figure 2. Geometric similarity between this plume simulator and the larger model simulator, reference 1, was maintained where possible. Total radial flow from the plume simulator is from 12 holes 5/64 in. diameter equally spaced around the circumference of the simulator, located 0.73 in. aft of the model base. Both the larger plume simulator and this simulator had a total sonic jet orifice area of 6.0% of the model cross-sectional area with the centerline of the orifice 0.66 body diameters (calibers) aft of the body base. Due to structural considerations the simulator diameter to model diameter ratio could not be matched. The simulator was tested for both leaks and structural integrity up to approximately 2000 psi chamber pressure. The simulator used in this test was 0.815 in. in diameter for a simulator to model diameter ratio of 0.74 as compared to 0.60 for the larger model, reference 2. Detailed descriptions of the plume simulator and all model parts including sting and adapter are contained in MIRADCOM drawings RDK-13900 series.

C. Instrumentation

Force and moment measurements were made by an AEDC six-component internal 3/4 in. strain-gage balance, 6-.75-.040-.52 mf. Two model

base pressures and the plume simulator chamber pressure were measured with transducers and plumbing integral to the sting-simulator hardware. Plume simulator chamber temperature was measured with an internal iron-constantan thermocouple.

III. TEST PROCEDURES AND CONDITIONS

The test was conducted through a Mach number range of 0.7 to 1.4. Tunnel and atmospheric conditions prevented obtaining a tunnel section Mach number of 1.5. Tunnel total temperature was varied from 125 to 180° F as required to prevent moisture condensation in the test section. The nominal tunnel test conditions are summarized in table II.

Data for single run/part number were obtained by varying angle-of-attack with Mach number and plume simulator chamber pressure held constant. Angle-of-attack was nominally varied from -3 to 4 degrees at zero yaw and roll "+" attitudes. Angle-of-attack was varied up to +6 degrees for the runs with the ground plane simulation, and two configurations were run with a 45 degree "x" roll angle. The plume simulator air supply was adjusted to give the preselected chamber pressure that gave the desired radial thrust coefficient (CRT) for the tunnel test section conditions. The values for chamber pressure at specified values of CRT along with the expression for computation is contained in table III. The mass flow rate varied up to 1.5 - 2.0 pounds per second.

During the shadowgraph and oil flow phases pictures were taken primarily at angles of attack of 0, 1, and 2 degrees. Force and moments were not recorded during the visualization phase of testing. The composition of oil used was 1 part titanium dioxide, 2 parts oil (mobil DTE heavy-medium duty oil) and 1 - 2 drops oleic acid per quart of above mixture.

IV. DATA

A. Reduction

All balance force coefficients are referenced to the cross-sectional area of the body, 0.95033 sq. in. The moment reference center is located at model station 5.83 inches aft of the nose or at 5.1 calibers forward of the body base. The moment coefficients are referenced to the body cross-sectional area times the body diameter (1.1 in.). The sign convention is the standard body axis system, positive nose up and right (climbing right turn). The two base pressures were averaged and ratioed to the free stream ambient pressure. The computation method of the radial thrust coefficient, and values obtained during the test are listed in table III. Corrections to angle-of-attack were made for sting and balance deflections caused by aerodynamic loads and model weight.

B. Uncertainty

Data uncertainty was estimated by AEDC for a confidence level of 95 percent. The values shown in table IV are based on the uncertainty of both balance measurements and tunnel conditions.

C. Presentation of Results

This report presents the results of the force phase of this test. Table V contains a complete run log for both the oil flow and shadow-graph phases along with the force measurement runs. During the initial part of the testing strain gage balance drift caused by a lead length temperature compensation problem was excessive. Because of this part (run) numbers through 50 are not included in the presentation with the exception of Mach number 1.35 data. Most of these data were repeated, and are presented in Appendix A.

1. Visualization Results

Approximately 145 oil flow and 138 shadowgraph photographs were taken at discrete Mach number, angle of attack, and simulated thrust levels. A number of the 70 mm oil flow prints have been enlarged, then superimposed onto the full sized shadowgraph prints to provide visualization of the combined body surface and external flow patterns at matching flow and plume simulator conditions. Sample combined prints with jet-off and two simulator pressures for body without fins are shown for Mach number 1.25 at one degree angle-of-attack on figures 3 through 5. Figure 6 shows the large fin-body (BF5) and figure 7 the combination of strake and gap fin (BF7S1) for $CRT = 7.2$. Analysis of the visualization results and how they are related to and aid in interpretation of force data is incomplete.

2. Force and Moment Results

The stability coefficients, normal force, side force, pitching moment, and yawing moment are shown in Appendix A for all configurations. The base pressure ratio as a function of CRT at the various Mach numbers are shown in figure 8. It should be pointed out here that the base pressure and especially the point of flow separation - boundary layer separation - on the afterbody is significantly affected by the condition of the body approach boundary layer. In addition to boundary layer properties of temperature, Reynolds number and turbulence, the thickness must be considered when comparing these results to either similar tests or prototype versions. However, the trends that exist for increases in simulator (CRT) magnitude, Mach number, angle-of-attack and limited comparisons between configurations should represent qualities of all similar situations. Samples of the rolling moment coefficients are

shown in figures 9 and 10. The data shown in figure 9 are all at Mach 1.25 for cases where the variations in side force and yawing moment (Appendix A) are quite large. Body alone data - jet off - is shown in figure 10. All coefficients will be retained for future reference.

The stability derivatives over the linear portion of the normal force and pitching moment curves near zero angle-of-attack (generally $-1.5 \leq \alpha \leq 1.5$ degrees) are presented in Appendix B for all configurations tested. A list of all of these slopes are contained in table VI. Comparisons of the jet off stability and forebody axial force coefficients are shown in figures 11 and 12.

REFERENCES

1. Batiuk, G., Henderson, J. H., "A Summary of Jet Plume Effects on the Stability Characteristics of a Body of Revolution with Various Fin Configurations at Mach Numbers from 0.2 to 2.3 (Normal Jet Plume Simulator)," U. S. Army Missile Command, Redstone Arsenal, Alabama, 13 December 1976, Report No. RD-77-12.
2. "Test Facilities Handbook" (Tenth Edition), Propulsion Wind Tunnel Facility, Vol. 4, Arnold Engineering Development Center, May 1974.

NOMENCLATURE

<u>SYMBOL</u>	<u>PLOT SYMBOL</u>	<u>DEFINITION</u>
$b/2$		fin chord length, in.
c		fin exposed semi-span, in.
C_A		axial force coefficient
C_{D_0}	CD_0	fore drag coefficient, total less base drag
C_ℓ	Cl	rolling moment coefficient
C_m	C_{LM}	pitching moment coefficient
C_n	C_{LN}	yawing moment coefficient
C_N	C_N	normal force coefficient
C_{m_α}	$C_{Ma}, C_{M_{ALPHA}}$	pitching moment slope at zero angle of attack
C_{N_α}	$C_{Na}, C_{N_{ALPHA}}$	normal force slope at zero angle of attack
C_Y	C_Y	side force coefficient
CRT	CRT	radial thrust coefficient
ℓ_{ref}	$LREF$	reference length, in.
M_∞		tunnel test section Mach number
P_b/P_∞	Pb/Pi	base to tunnel static pressure ratio
P_t		tunnel stagnation pressure, psfa
q_∞		tunnel test section dynamic pressure, psf
R_N		Reynolds number, per foot

NOMENCLATURE (Continued)

<u>SYMBOL</u>	<u>PLOT SYMBOL</u>	<u>DEFINITION</u>
S_{ref}	SREF	reference area used to reduce data to coefficient form, in.
t		fin thickness, in.
X_{cp}	XCP	center of pressure in calibers from nose
X_{mrp}	XMRP	moment reference point on X axis
α	ALPHA	angle of attack, degrees
ϕ	PHI	angle of roll, degrees

TABLE I
MODEL GEOMETRY

Config.	c (in.)	b/2 (in.)	Gap (in.)	t (in.)	Profile	Remarks
B	---	---	---	---	---	Body alone
F2	0.66	0.55	0.0	0.033	1/4c Wedge Flat Plate	Fin
F5	↓	1.32	↓	↓	↓	↓
F6	↓	1.045	0.275	↓	↓	↓
F7	↓	0.77	0.55	↓	↓	↓
F8	2.31	0.55	0.0	↓	↓	↓
*S1	1.10	0.15	↓	↓	Flat with Round L.E.	Strake
S2	↓	0.30	↓	↓	↓	↓
**FL	↓	0.15	---	---	Flare Angle 7.75°	---

* Trailing edge of strakes 1.50 calibers from base.

** Flare base 1.0 caliber from base.

TABLE II
NOMINAL TEST CONDITIONS

M_∞	P_t (psfa)	q_∞ (psf)	$R_N \times 10^{-6}$ (per ft.)
0.60	2850	563	4.001
0.70	↓	705	4.426
0.90	↓	955	5.013
1.00	↓	1054	5.187
1.10	↓	1130	5.287
1.25	↓	1204	4.999
1.40	↓	1229	4.916

TABLE III
NOMINAL PLUME SIMULATOR CHAMBER PRESSURE

MACH	CRT							
	2.5	3	4.2	6	7.2	9	12	18
0.7	172	204	281	397	474	590	783	1169
0.9	227	271	376	533	637	794	1056	1579
1.0	249	297	412	585	701	874	1163	1740
1.1	265	317	441	627	750	936	1246	
1.25	281	336	467	665	797	995		
1.4	285	341	476	678				

where
$$CRT = A_{nj} (0.5283 \times P_c (1.4 \times M_j^2 + 1) - P_s/144) / (A_{ref} \times q/144)$$

A_{nj} = Total exit area, 12 orifices

$A_{nj}/A_{ref} = 0.06$

M_j = Sonic jet ($M=1.0$)

q = Free stream dynamic pressure, psf

P_c = Chamber pressure in simulator, psi

P_s = Tunnel static pressure, psf

P_t = 2850 psi -- tunnel total pressure

TABLE IV
DATA UNCERTAINTY

M_∞	ΔM_∞	Δq (psf)	ΔC_N	ΔC_Y	ΔC_A	ΔC_m	ΔC_n	ΔC_ℓ
0.60	$\pm .003$	± 4.75	$\pm .059$	$\pm .036$	$\pm .029$	$\pm .031$	$\pm .046$	$\pm .012$
0.70	$\pm .003$	± 4.35	$\pm .047$	$\pm .028$	$\pm .023$	$\pm .025$	$\pm .037$	$\pm .009$
0.90	$\pm .003$	± 3.79	$\pm .035$	$\pm .021$	$\pm .017$	$\pm .018$	$\pm .027$	$\pm .007$
1.00	$\pm .004$	± 3.93	$\pm .032$	$\pm .019$	$\pm .016$	$\pm .017$	$\pm .024$	$\pm .006$
1.10	$\pm .006$	± 4.30	$\pm .030$	$\pm .018$	$\pm .015$	$\pm .016$	$\pm .023$	$\pm .006$
1.25	$\pm .012$	± 4.45	$\pm .028$	$\pm .017$	$\pm .014$	$\pm .015$	$\pm .021$	$\pm .005$
1.40	$\pm .025$	± 1.96	$\pm .027$	$\pm .016$	$\pm .013$	$\pm .014$	$\pm .021$	$\pm .005$

TEST RUN NUMBERS

TABLE V. DATA SET SUMMARY
FORCE AND MOMENT PHASE

TEST AEDC TM-350

Data Set	Config	Mach No.	α	ϕ	0	2.5	3	4.2	6	7.2	8.2	9	12	14	18
B60001	B	0.7	A	0	522				525			524			523
02	B	0.9	A	0	517				516			515			
03	B	1.0	A	0	513	512			511			526*			
04	B	1.1	A	0	504, 508	510			509			506			
05	B	1.25	A	0	496	501		500		43, 497					
06	B	1.35	A	0	48	47	46	45							
07	B	1.4	A	0	528	531	530	529							
08	BFL	0.7	A	0	595				598			597			596
09	BFL	1.0	A	0	589	592			591			590			
10	BFL	1.25	A	0	583	588		586		585		587			
11	BF2	0.7	A	0	562				567			564	563		
12	BF2	1.0	A	0	568	571			570				569		
13	BF2	1.25	A	0	573	576		575		574					
14	BF2	1.25	A	45	578			580	579						
15	BF2/A	1.25	A	0	712	717		716		715	714	713			
16	BF2/B	0.7	B	0	739				742				741		740
17	BF2/B	0.9	B	0	727	730			729				728		
18	BF2/B	1.0	B	0	731				733			732	738		
19	BF2/B	1.1	B	0	734				736			735			
20	BF2/B	1.25	B	0	720	724		723		721		722			
21	BF2/B	1.4	B	0	743	746		745	744						
22	BF5	0.7	A	0	544				547			546			545
23	BF5	0.9	A	0	548				550			549			
24	BF5	1.0	A	0	551	553			552				555		
25	BF5	1.1	A	0	559	558			557			556			
26	BF5	1.25	A	0	538	540		539		543					
27	BF5	1.4	A	0	534	537	536	535							
28	BF6	0.7	A	0	601				604			603			602

BF2/A = Forward Location

BF2/B = Aft Location, Solid Bottom Wall

α Schedules: A = +4, +3, +2, +1.5, +1.0, +0.5, 0

B = +6, +4, +3, +2, +1.5, +1.0, +0.5, 0

* CRT=11

TABLE V. DATA SET SUMMARY (continued)
FORCE AND MOMENT PHASE (concluded)

TEST AEDC TM-350			CRT												
Data Set	Config	Mach No.	α	ϕ	0	2.5	3	4.2	6	7.2	8.2	9	12	14	18
B60029	BF6	1.0	A	0	605	607			606				609		
30	BF6	1.25	A	0	610	613		612		611					
31	BF7	0.7	A	0	627				626			625			624
32	BF7	1.0	A	0	628	630			629				623		
33	BF7	1.25	A	0	615	619		618	617	616					
34	BF8	0.7	A	0	642				641			640			635
35	BF8	1.0	A	0	639	638			637				636		
36	BF8	1.25	A	0	645	648		647		646					
37	BS1	0.7	A	0	669							670			664
38	BS1	1.0	A	0	668	667			666			665			
39	BS1	1.25	A	0	658	661		660		659	663	662			
40	BS1	1.25	A	45	651			655	654	653	652				
41	BS2	0.7	A	0	698							697			
42	BS2	1.0	A	0	693	696			695			694			
43	BS2	1.25	A	0	687	692		691		690	689	688			674
44	BF7S1	0.7	A	0	673							678			
45	BF7S1	1.0	A	0	677				676				675		
46	BF7S1	1.25	A	0	684	683		682		681	680	679			
47	BF5S1	0.7	A	0	702				706			705			
48	BF5S1	1.0	A	0	701				704				703		
49	BF5S1	1.25	A	0	707			709		708					
50	B	0.7	0	0	5 - Variable CRT - Base Pressure Data Only										
51	B	1.0	0	0	50 - Variable CRT - Base Pressure Data Only										
52	B	1.25	0	0	49 - Variable CRT - Base Pressure Data Only										

TABLE V. DATA SET SUMMARY (continued)
OIL VISUALIZATION PHASE

TEST AEDC TM-350																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
Data Set	Config	Mach No.	α	ϕ	CRT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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TABLE V. DATA SET SUMMARY (continued)
OIL VISUALIZATION PHASE (continued)

TEST AEDC TM-350

Data Set	Config	Mach No.	α	ϕ	CRT												
					0	2.5	3	4.2	6	7.2	8.2	9	12	14	18		
	BF7	1.0	1	0		178				175							
	BF7	1.0	2	0		177				176							
	BF7	1.25	0	0	158,169	168		157	163	151							
	BF7	1.25	1	0	159,170	167		156	164	152							
	BF7	1.25	2	0	160,171	166		155	165	153,154							
	BFL	0.7	0	0	193,194							207			200		
	BFL	0.7	1	0	195							206			201		
	BFL	0.7	2	0	196							205			202		
	BFL	0.7	3	0								204			203		
	BFL	1.0	-2	0	222												
	BFL	1.0	0	0	221	216			215				210				
	BFL	1.0	1	0	220	217			214				211				
	BFL	1.0	2	0	219	218			213				212				
	BFL	1.25	0	0	231					230		225					
	BFL	1.25	1	0	232					229		226					
	BFL	1.25	2	0	233					228		227					
	BS1	0.7	0	0	274							273			268		
	BS1	0.7	1	0	275							272			269		
	BS1	0.7	2	0	276							271			270		
	BS1	1.0	0	0	265	262			261			256					
	BS1	1.0	1	0		263			260			257					
	BS1	1.0	2	0		264			259			258					
	BS1	1.25	-1	0		253											
	BS1	1.25	0	0	242	252		247		241		236					
	BS1	1.25	1	0	243	251		248		240		237					
	BS1	1.25	2	0	244	250		249		239		238					
	BF7S1	0.7	0	0								284			279		
	BF7S1	0.7	1	0								283			280		
	BF7S1	0.7	2	0								282			281		

TEST AEDC TM-350

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TABLE V. DATA SET SUMMARY (continued)
SHADOWGRAPH VISUALIZATION PHASE

TEST AEDC TM-350

Data Set	Config	Mach No.	α	ϕ	CRT												
					0	2.5	3	4.2	6	7.2	8.2	9	12	14	18		
B		0.7	0	0	363								369*		368		
B		0.7	1	0	364								370*		367		
B		0.7	2	0	365								371*		366		
B		1.0	0	0	351	362			357				356				
B		1.0	1	0	352	361			358				355				
B		1.0	2	0	353	360			359				354				
B		1.25	0	0	333	345		344		339		338					
B		1.25	1	0	334	346		343		340		337					
B		1.25	2	0	335	347		342		341		336					
BF5		0.7	0	0	374								380*		379		
BF5		0.7	1	0	375								381*		378		
BF5		0.7	2	0	376								382*		377		
BF5		1.0	0	0	383	389			388								
BF5		1.0	1	0	384	390			387								
BF5		1.0	2	0	385	391			386								
BF5		1.25	0	0	392	404		403		398		397					
BF5		1.25	1	0	393	405		402		399		396					
BF5		1.25	2	0	394	406		401		400		395					
BS1		1.25	0	0	409	420		415		414	428	423					
BS1		1.25	1	0	410	419		416		413	427	424					
BS1		1.25	2	0	411	418		417		412	426	425					
BF7S1		1.25	0	0	431	448		443		442	437	436					
BF7S1		1.25	1	0	432	447		444		441	438	435					
BF7S1		1.25	2	0	433	446		445		440	439	434					
BFL		1.25	0	0	451			464		462, 463		458					
BFL		1.25	1	0	452			465		461/1		455, 459					
BFL		1.25	2	0	453			466		461/2		454, 456					
BS1		1.25	0	45	469			481		476	475						

*CRT-11

TABLE V. DATA SET SUMMARY (concluded)

TEST AEDC TM-350

[illegible]

TABLE VI. SUMMARY OF STABILITY DERIVATIVES - $C_{N\alpha}$

TEST AEDC TM-350

Data Set	Config	Mach No.	α	ϕ	CRT													
					0	2.5	3	4.2	6	7.2	8.2	9	12	14	18			
B60001	B	0.7	A	0	.0445				.0030			-.0423			-.0777			
02	B	0.9	A	0	.0484				-.0520			-.1046						
03	B	1.0	A	0	.0500	.0115			-.0678			-.1000*						
04	B	1.1	A	0	.0503	-.0064			-.0841			-.0793						
05	B	1.25	A	0	.0515	-.0052		-.0887		-.2107								
06	B	1.35	A	0	.0483	-.0115	-.0259	-.0799										
07	B	1.4	A	0	.0495	-.0041	-.0117	-.0611				.0432			.0409			
08	BFL	0.7	A	0	.0540				.0464				.0315					
09	BFL	1.0	A	0	.0611	.0629			.0439			-.0424						
10	BFL	1.25	A	0	.0646	.0645		.0507		.0063		-.0150	-.1338					
11	BF2	0.7	A	0	.1158				.0393				-.0981					
12	BF2	1.0	A	0	.1310	.0566			-.1035									
13	BF2	1.25	A	0	.1405	-.0422		-.0526		-.1210								
14	BF2	1.25	A	45	.1237			-.0586	-.0977									
15	BF2/A	1.25	A	0	.1549	.1000		.0531		-.1177	-.2614	-.4636			.0238			
16	BF2/B	0.7	B	0	.1176				.0497				-.0852					
17	BF2/B	0.9	B	0	.1263	.0696			-.0966			.0093	.0096					
18	BF2/B	1.0	B	0	.1291				-.1748			.0422	.0157					
19	BF2/B	1.1	B	0	.1323				-.0858			.0083						
20	BF2/B	1.25	B	0	.1403	-.0314		-.0476		-.0808								
21	BF2/B	1.4	B	0	.1268	-.0036		-.0787	-.0356									
22	BF5	0.7	A	0	.2502				.1275			.0356			-.1515			
23	BF5	0.9	A	0	.4180				.0748			-.1756						
24	BF5	1.0	A	0	.2976	.2015			-.0761				-.0949					
25	BF5	1.1	A	0	.2982	.1279			-.0408			-.0476						
26	BF5	1.25	A	0	.2989	.0736		-.0194		-.1258								
27	BF5	1.4	A	0	.2623	.1233	.0123	-.0660										
28	BF6	0.7	A	0	.1508				.0683			.0285			-.0307			

BF2/A = Forward Location

BF2/B = Aft Location, Solid Bottom Wall

α Schedules: A = +4, +3, +2, +1.5, +1.0, +0.5, 0
B = +6, +4, +3, +2, +1.5, +1.0, +0.5, 0

*CRT=11

C_N^α (concluded)

TEST AEDC TM-350

Data Set	Config	Mach No.	α	ϕ	CRT											
					0	2.5	3	4.2	6	7.2	8.2	9	12	14	18	
B60029	BF6	1.0	A	0	.1747	.1094			-.0101							
30	BF6	1.25	A	0	.1699	.0875		-.0082		-.1862						
31	BF7	0.7	A	0	.1106				.0624				.0448			
32	BF7	1.0	A	0	.1399	.0782			.0398					-.0135		-.0233
33	BF7	1.25	A	0	.1339	.0696		-.0108	-.0879	-.1706						
34	BF8	0.7	A	0	.1298				.0757				.0213			-.3171
35	BF8	1.0	A	0	.1418	.0724			-.3384					-.4439		
36	BF8	1.25	A	0	.1716	-.0729		-.3984		-.7039						
37	BS1	0.7	A	0	.0474								-.0163			-.0717
38	BS1	1.0	A	0	.0582	.0324			-.0511				-.0882			
39	BS1	1.25	A	0	.0647	.0012		-.0475		-.1759	-.1063		.0287			
40	BS1	1.25	A	45	.0603			-.0559	-.1561	-.1060	-.0684					
41	BS2	0.7	A	0	.0788								.0003			
42	BS2	1.0	A	0	.0847	.0525			-.0376				-.0786			
43	BS2	1.25	A	0	.0858	.0471		-.0264		-.1559	-.1796		-.0858			-.0384
44	BF7S1	0.7	A	0	.1192											
45	BF7S1	1.0	A	0	.1471				.0417					-.0542		
46	BF7S1	1.25	A	0	.1480	.0833		-.0315		-.1636	.0232		.0882			
47	BF5S1	0.7	A	0	.2640				.1598				.0642			
48	BF5S1	1.0	A	0	.2913				-.0037					-.0412		
49	BF5S1	1.25	A	0	.3008			.0007		-.0787						

TABLE VI. SUMMARY OF STABILITY DERIVATIVES (continued)

 $C_{m\alpha}$

TEST AEDC TM-350

Data Set	Config	Mach No	α	ϕ	CRT											
					0	2.5	3	4.2	6	7.2	8.2	9	12	14	18	
B60001	B	0.7	A	0	.1372				.2635				.4707			.5847
02	B	0.9	A	0	.1257				.4949				.7191			
03	B	1.0	A	0	.1012	.2393			.5652				.6382*			
04	B	1.1	A	0	.1194	.3749			.6054				.5254			
05	B	1.25	A	0	.1183	.3855		.7286		1.0412						
06	B	1.35	A	0	.1563	.4446	.4951	.6929								
07	B	1.4	A	0	.1647	.4127	.4799	.6390								
08	BFL	0.7	A	0	.1322				.1169				.1378			.1471
09	BFL	1.0	A	0	.0684	.0895			.1305				.1778			
10	BFL	1.25	A	0	.0702	.0891		.1472		.3063			.4755			
11	BF2	0.7	A	0	-.1740				.1003				.3320	.8741		
12	BF2	1.0	A	0	-.2697	.0561			.7669					.6249		
13	BF2	1.25	A	0	-.2839	.5605		.5425		.6644						
14	BF2	1.25	A	45	-.2699			.5549	.6448							
15	BF2/A	1.25	A	0	-.1703	.0598		.1803		.7466	1.2056	1.8334		.6616		.1486
16	BF2/B	0.7	A	0	-.1926				.1129					.1676		
17	BF2/B	0.9	A	0	-.2521	.0039			.7544				.1936	.1596		
18	BF2/B	1.0	A	0	-.2665				1.0588				.0564			
19	BF2/B	1.1	A	0	-.2730				.6252				.0388			
20	BF2/B	1.25	A	0	-.2708	.5078		.4895		.4882						
21	BF2/B	1.4	A	0	-.2037	.4146		.7219	.4614							
22	BF5	0.7	A	0	-.8485				-.2581				.1017			.9159
23	BF5	0.9	A	0	-1.6036				-.0295			1.0598				
24	BF5	1.0	A	0	-1.0477	.5686			.5971				.5975			
25	BF5	1.1	A	0	-1.0373	.2235			.4416				.3635			
26	BF5	1.25	A	0	-1.0186	.0629		.3920		.6983						
27	BF5	1.4	A	0	-.8598	.1796	.3670	.6680								
28	BF6	0.7	A	0	-.3679				-.0237				.2045			.3761

* CRT=11

C_{m_α} (concluded)

Data Set	Config	Mach No.	α	ϕ	CRT											
					0	2.5	3	4.2	6	7.2	8.2	9	12	14	18	
860029	BF6	1.0	A	0	-.4908	-.1693			.3313							
30	BF6	1.25	A	0	-.4400	-.0446		.3663		.9932			.3774			
31	BF7	0.7	A	0	-.2005			-.0043					.1191			.3865
32	BF7	1.0	A	0	-.3276	-.0176			.1275				.2875			
33	BF7	1.25	A	0	-.2692	.0542		.3804	.6122	.9057						
34	BF8	0.7	A	0	-.1779				.0714				.2475			1.5798
35	BF8	1.0	A	0	-.2440	.1079			1.7718				1.8892			
36	BF8	1.25	A	0	-.2644	.8093		2.0457		2.9912						
37	BS1	0.7	A	0	.1074								.4120			.5206
38	BS1	1.0	A	0	.0787	.2147			.5133				.6305			
39	BS1	1.25	A	0	.1099	.3596		.5238		.9108	.6229		.1721			
40	BS1	1.25	A	45	.0999			.5577	.8757	.6149	.4629					
41	BS2	0.7	A	0	.0448				.4732				.3223			
42	BS2	1.0	A	0	.0223	.1484							.5985			
43	BS2	1.25	A	0	.0577	.2570		.5472		.8246	.9211		.6243			.4312
44	BF7S1	0.7	A	0	-.2250											
45	BF7S1	1.0	A	0	-.3192				.1569				.4025			
46	BF7S1	1.25	A	0	-.3015	-.0139		.4695		.8371	.1225		.0205			
47	BF5S1	0.7	A	0	-.8450				-.3966				.0214			
48	BF5S1	1.0	A	0	-.9831				.3190				.3991			
49	BF5S1	1.25	A	0	-.9864			.3284		.5497						

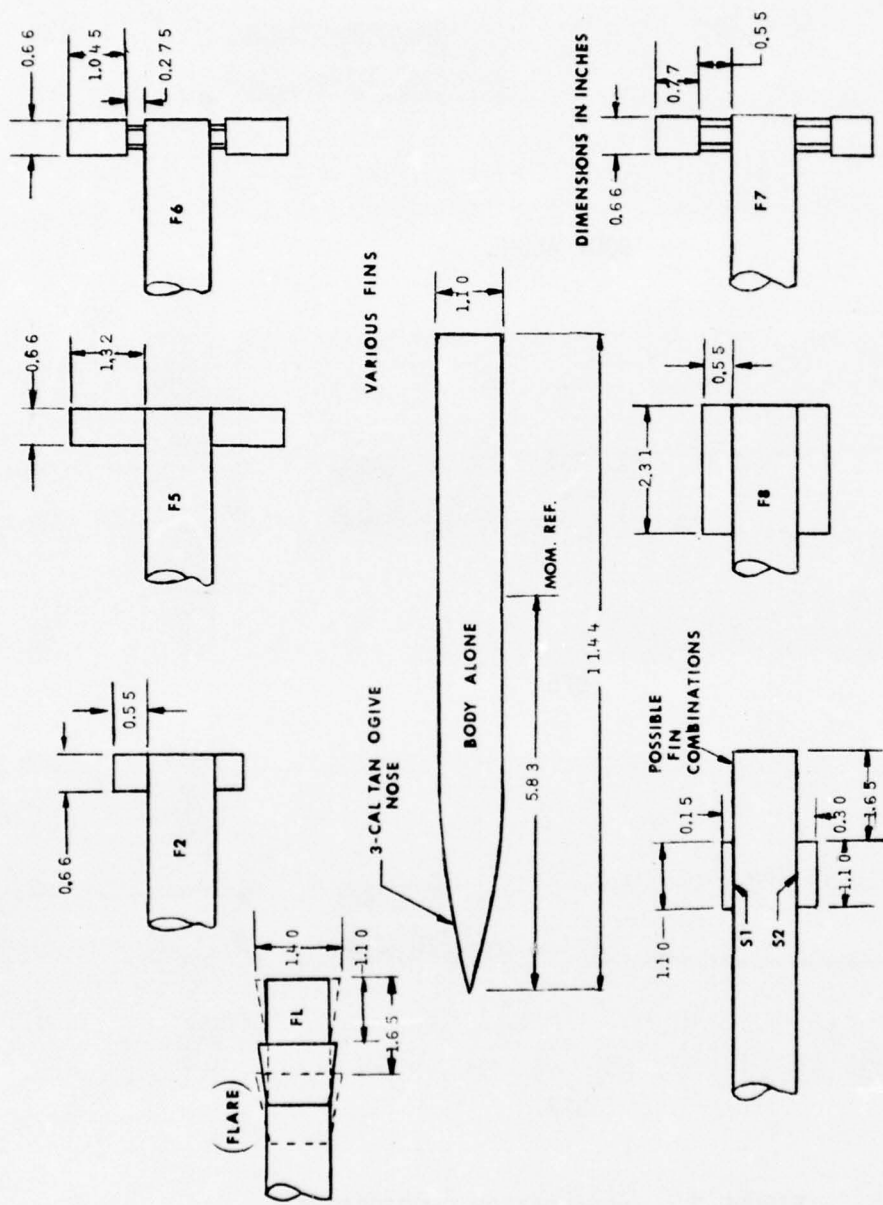
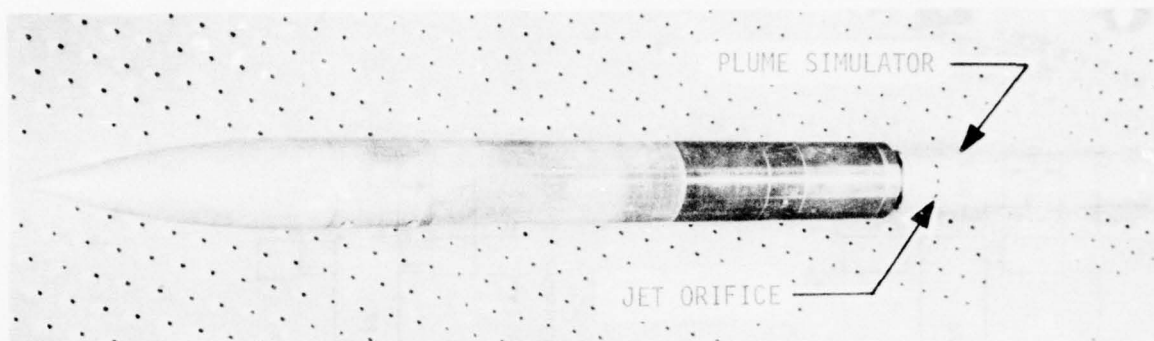
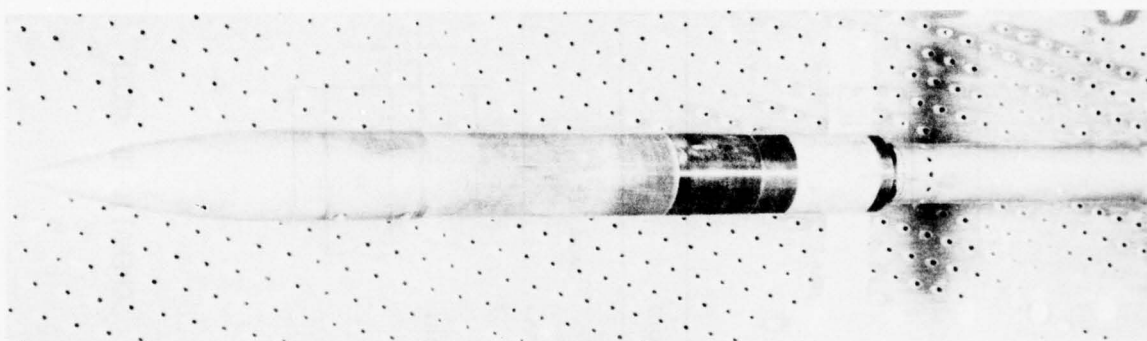


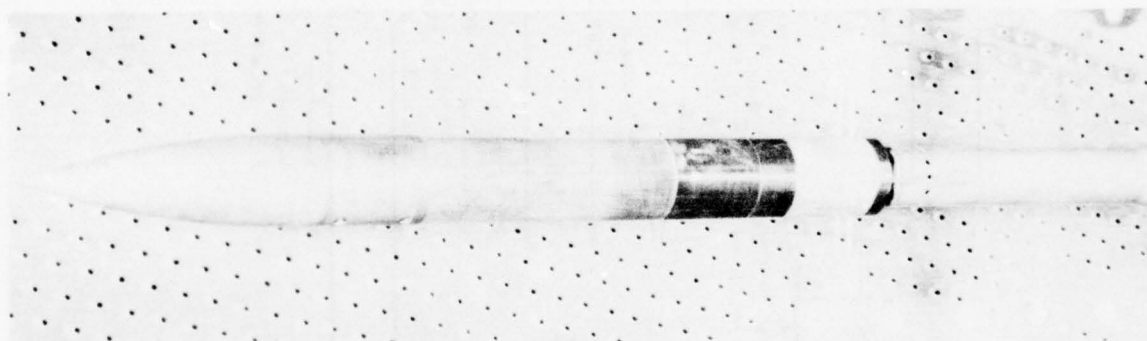
FIGURE 1. SCHEMATIC OF MODEL



BODY ALONE

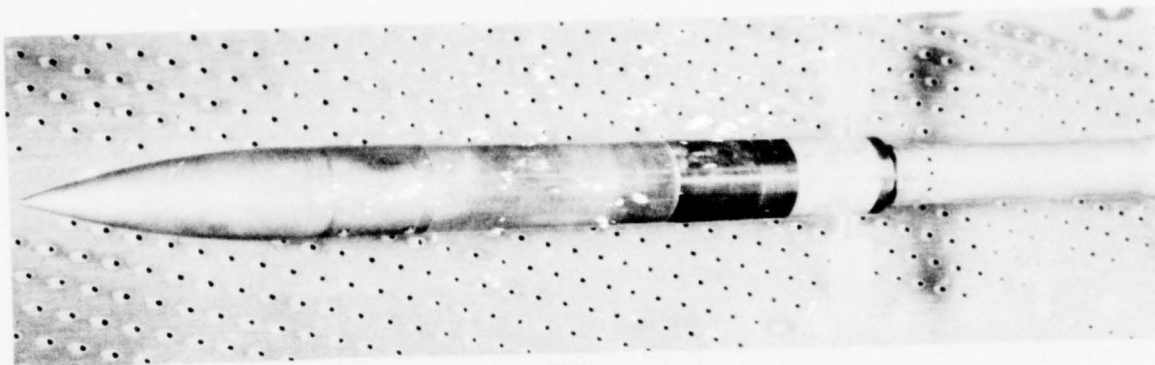


BF5

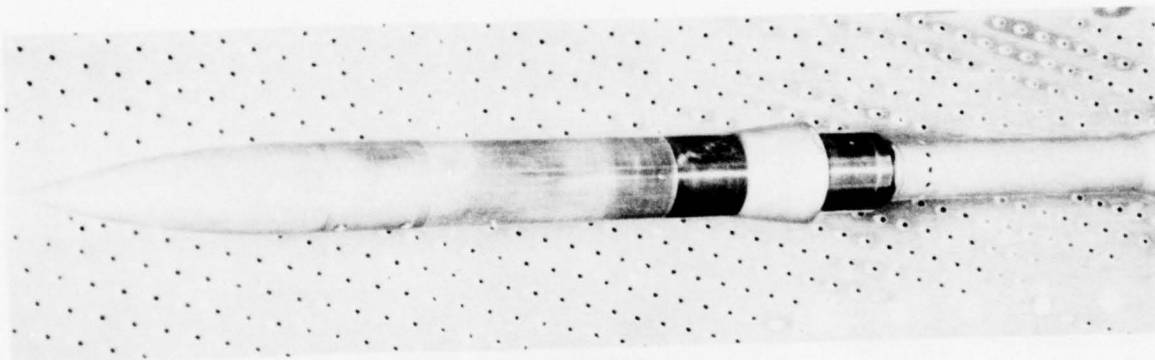


BF7

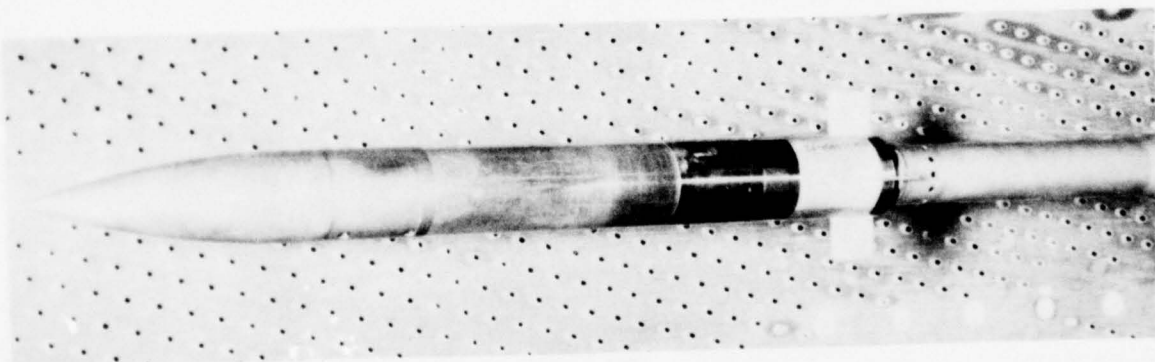
FIGURE 2. INSTALLATION PHOTOGRAPHS



BF6

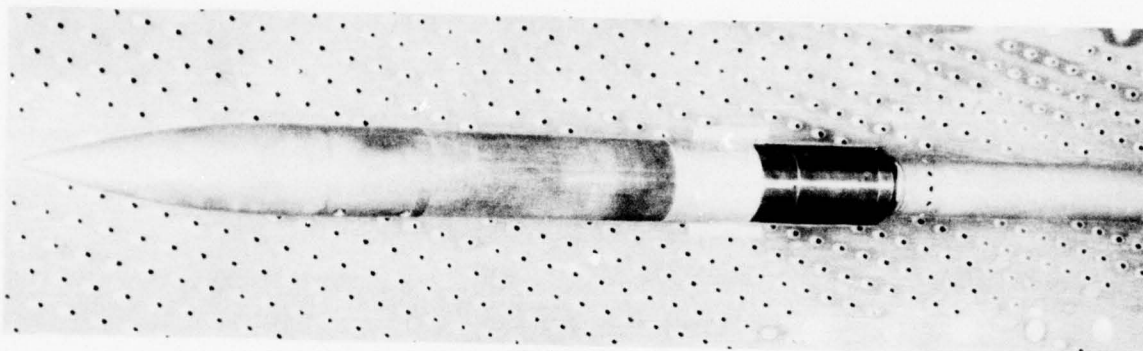


BODY FLARE

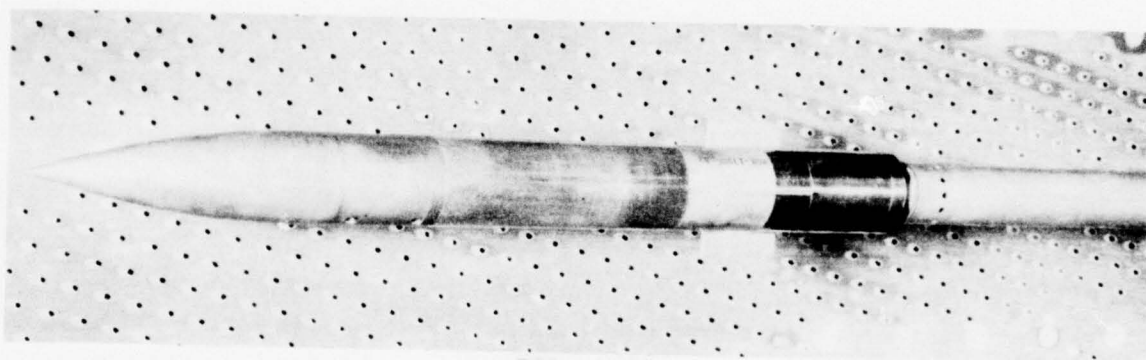


BF2

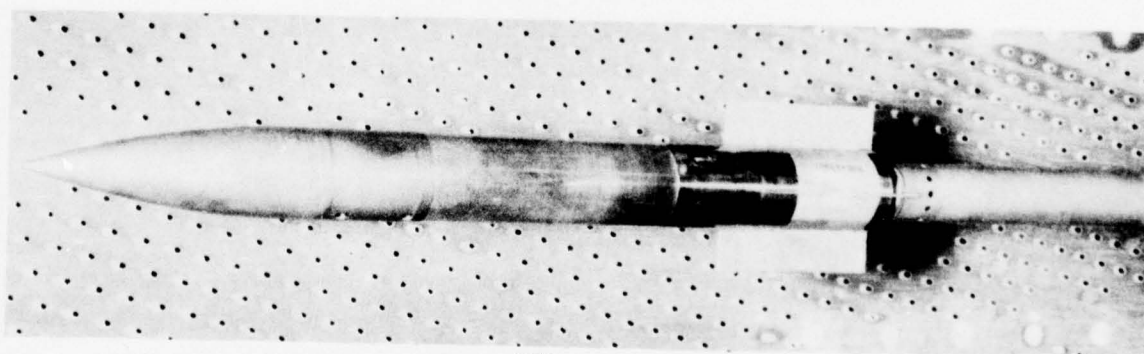
FIGURE 2. CONTINUED



BS1

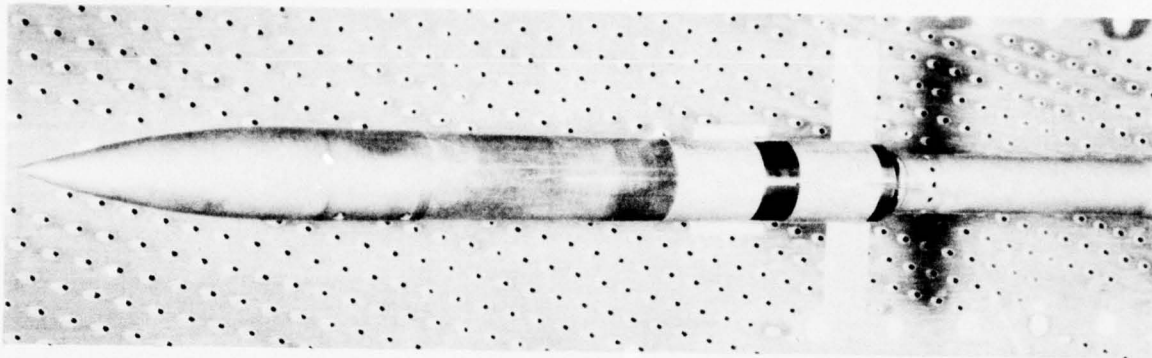


BS2

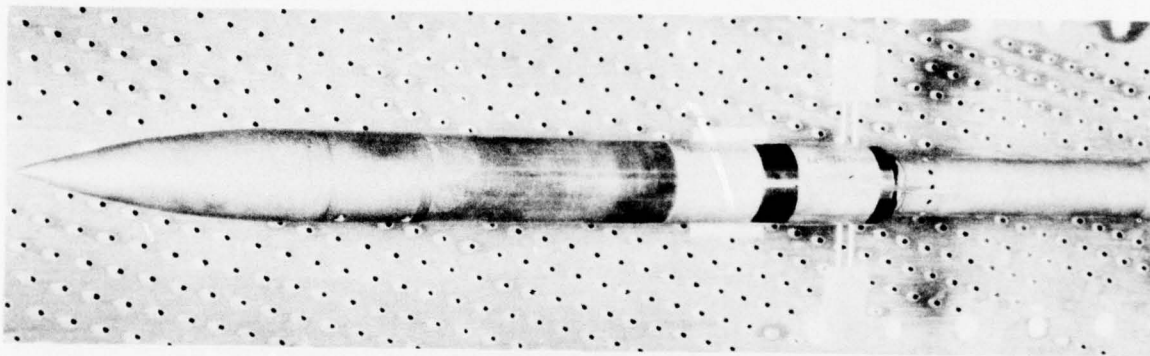


BF8

FIGURE 2. CONTINUED



BF5S1



BF7S1

FIGURE 2. CONCLUDED

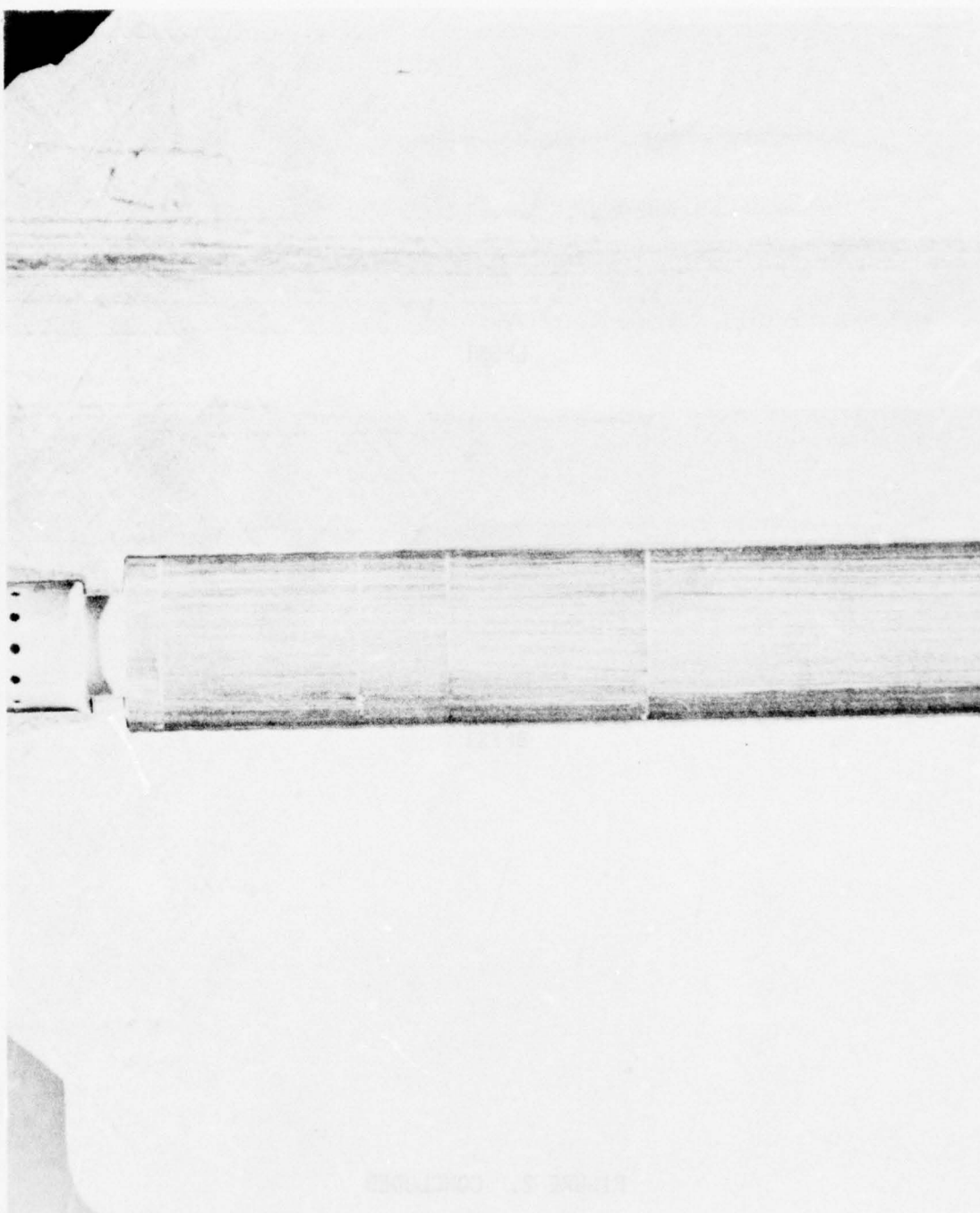


FIGURE 3. COMBINED OIL FLOW/SHADOWGRAPH
BODY ALONE, $M_{\infty}=1.25$, $CRT=0$, $\alpha=1^{\circ}$

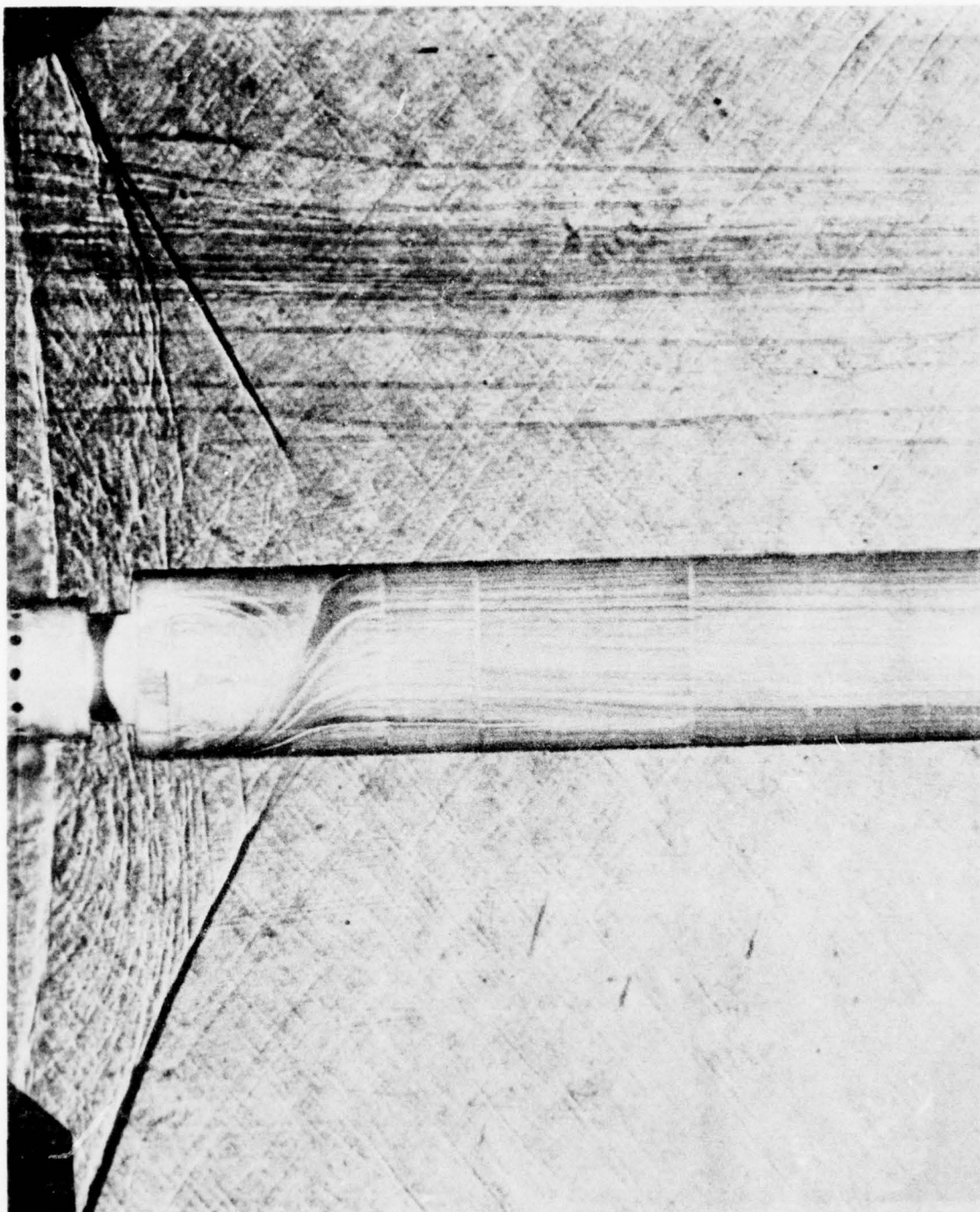


FIGURE 4. COMBINED OIL FLOW/SHADOWGRAPH
BODY ALONE, $M_{\infty}=1.25$, $CRT=4.2$, $\alpha=1^{\circ}$

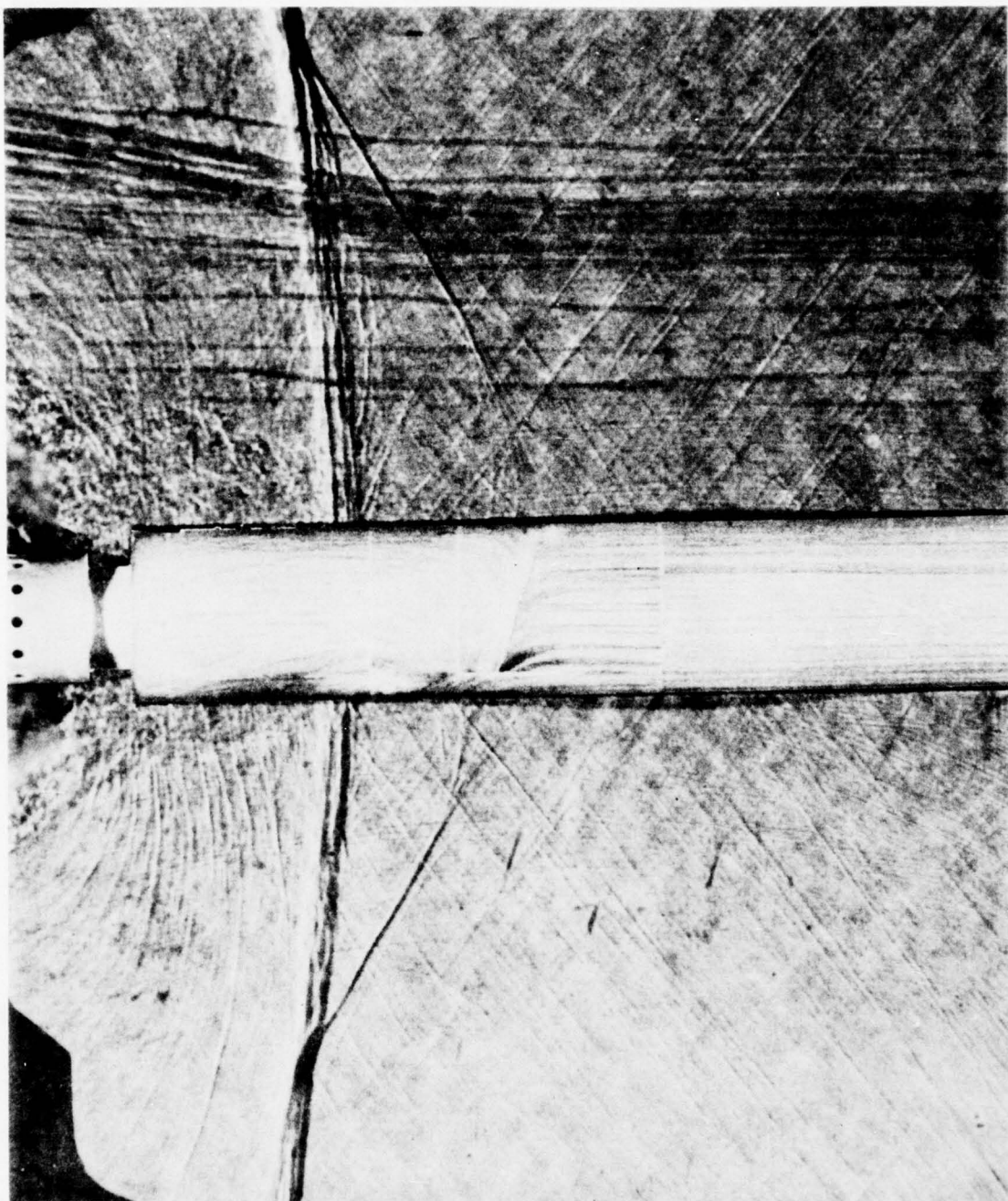


FIGURE 5. COMBINED OIL FLOW/SHADOWGRAPH
BODY ALONE, $M_{\infty}=1.25$, $CRT=7.2$, $\alpha=1^{\circ}$

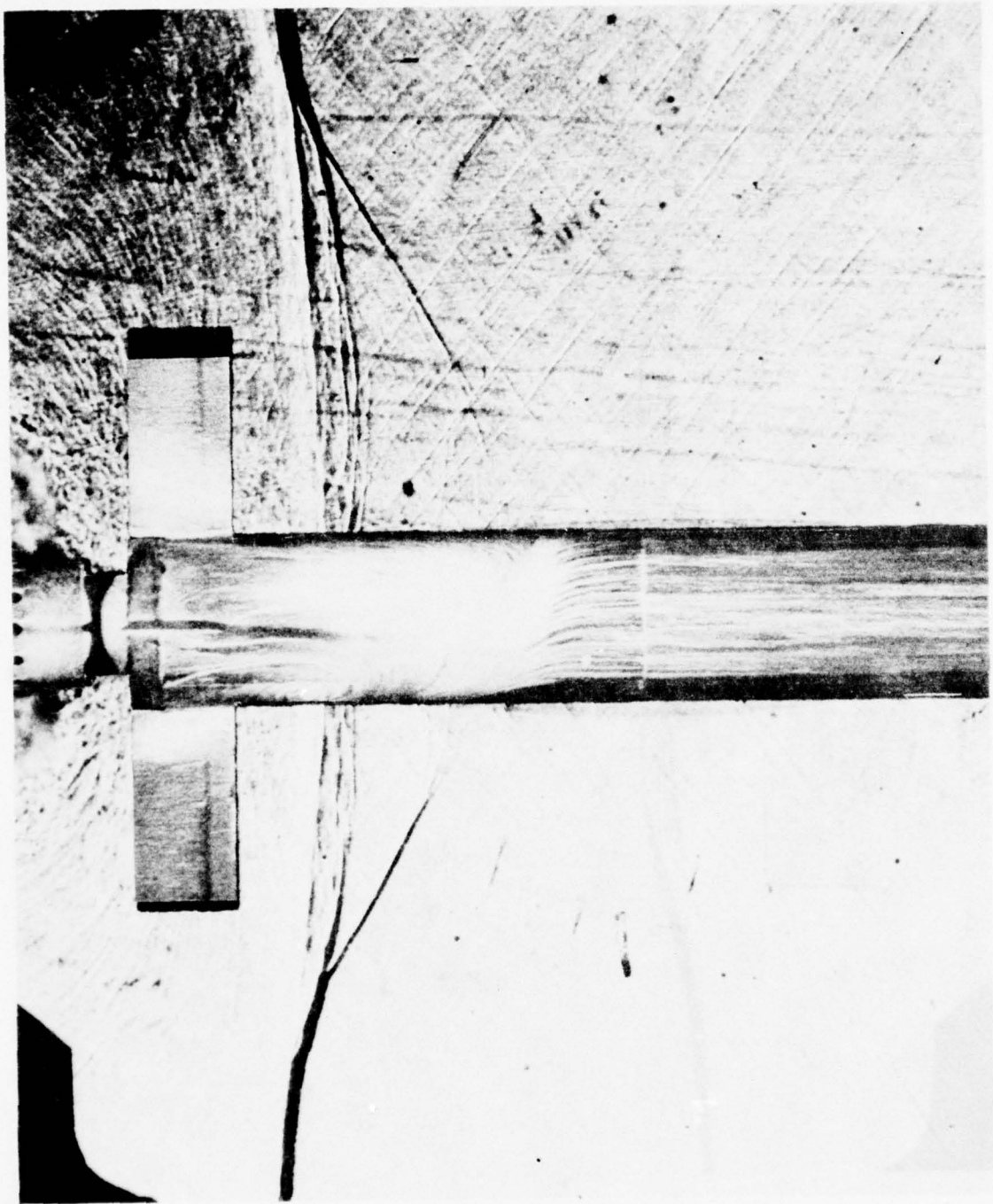


FIGURE 6. COMBINED OIL FLOW/SHADOWGRAPH
BF5, $M_{\infty}=1.25$, CRT=7.2, $\alpha=1^{\circ}$

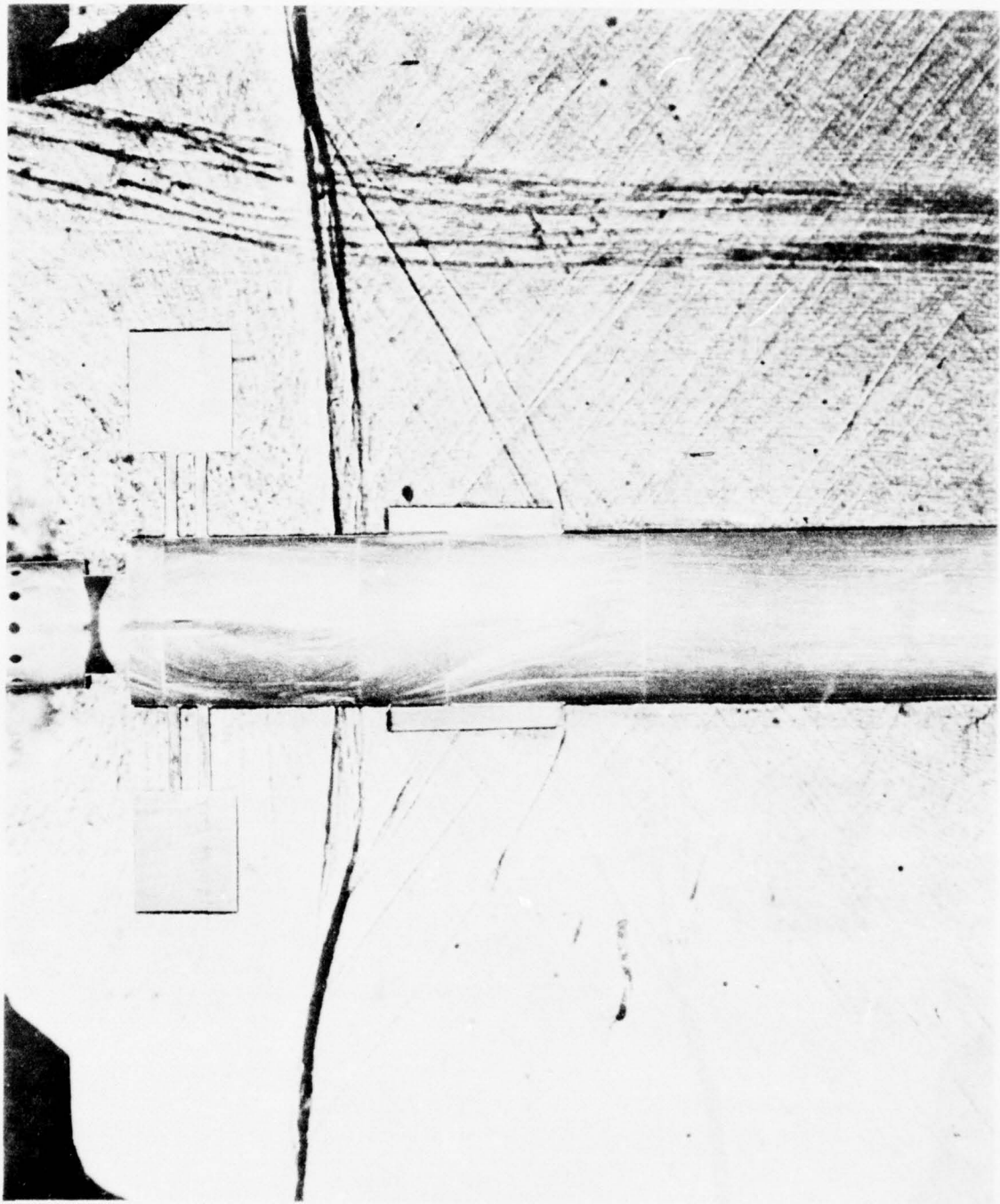


FIGURE 7. COMBINED OIL FLOW/SHADOWGRAPH
BF7S1, $M_\infty=1.25$, CRT=7.2, $\alpha=1^\circ$

SYN MACH

CONFIGURATION Body Alone

0 0.70
X 1.00
+ 1.25

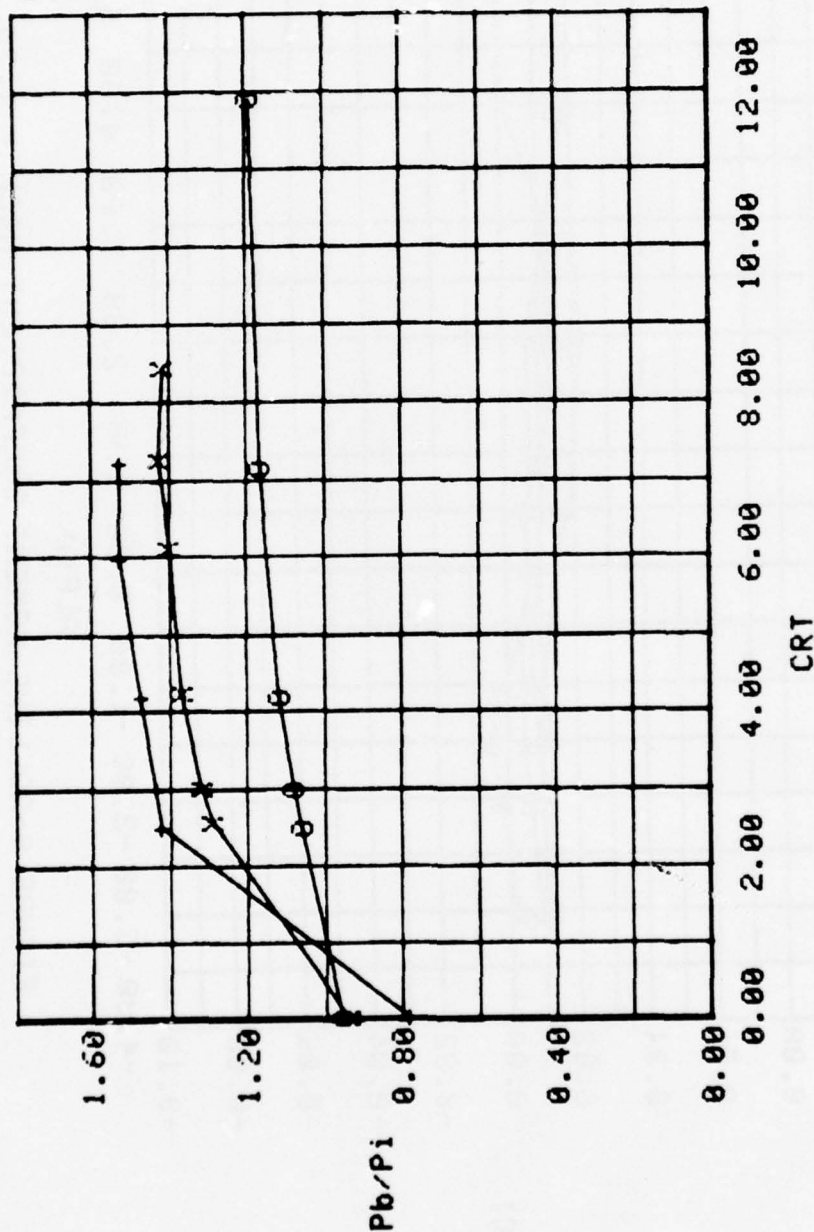


FIGURE 8 - BASE PRESSURE RATIO VERSUS CRT

CONFIGURATION BF5
 SYM CRT
 0 X + *

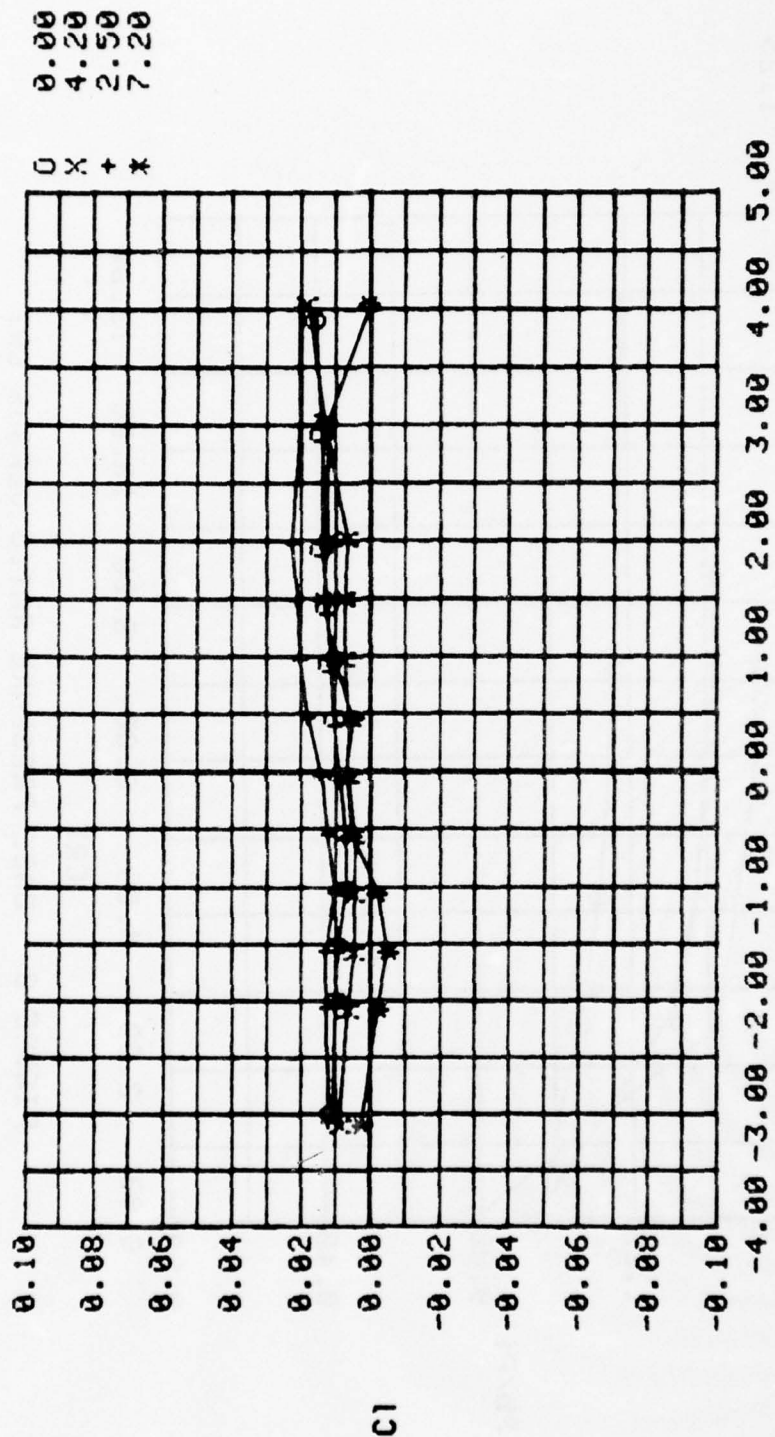


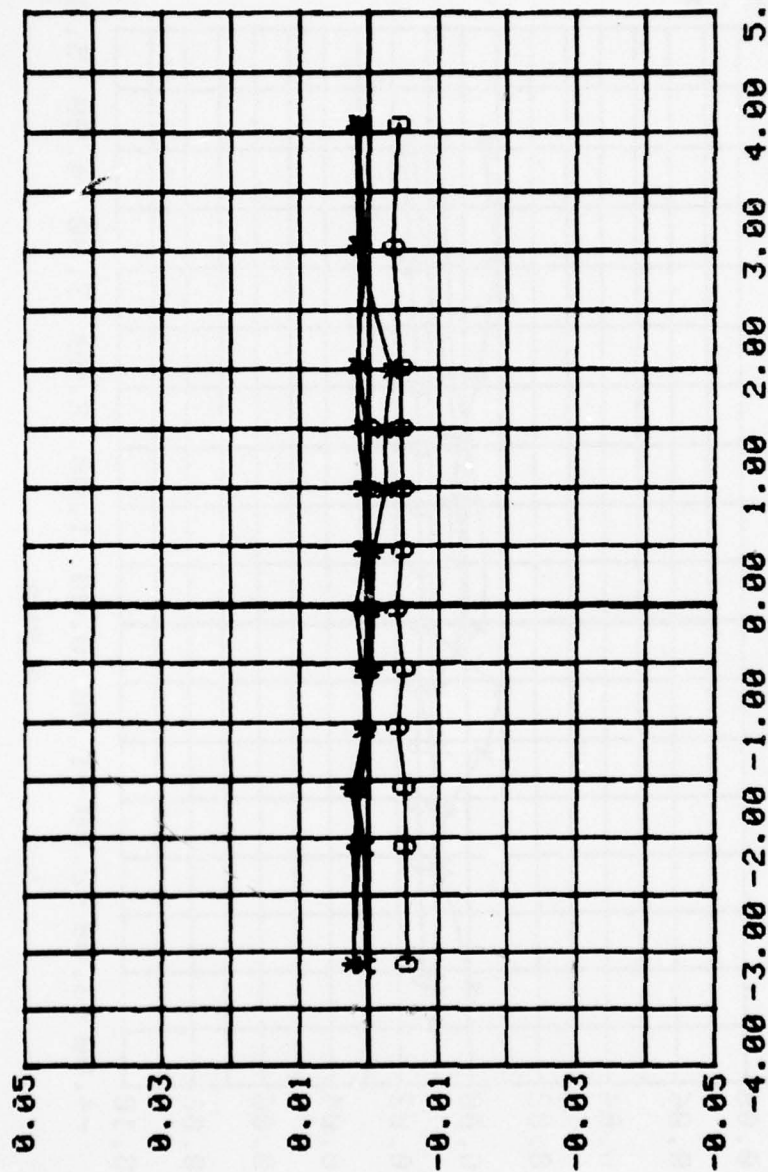
FIGURE 9-ROLLING MOMENT COEFFICIENT MACH = 1.25
 ALPHA

CONFIGURATION BS1

SYM CRT

0.00
2.50
4.20
9.00

0 X + *



ALPHA

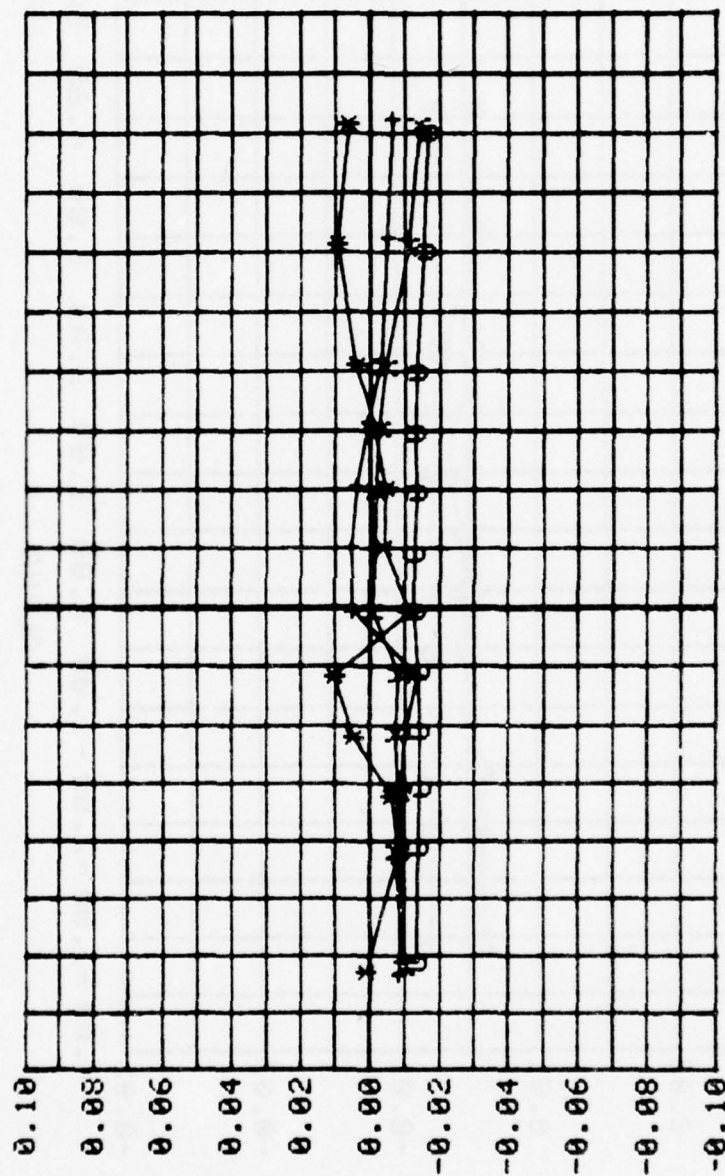
FIGURE 9-CONTINUED

C1

CONFIGURATION BF8

SYM CRT

0 0.01
X 2.50
+ 4.20
* 7.20



ALPHA

FIGURE 9 CONTINUED

C1

CRT = 0.00

SYM MACH

0.70
0.90
1.00
1.25
1.40

OX + * Z

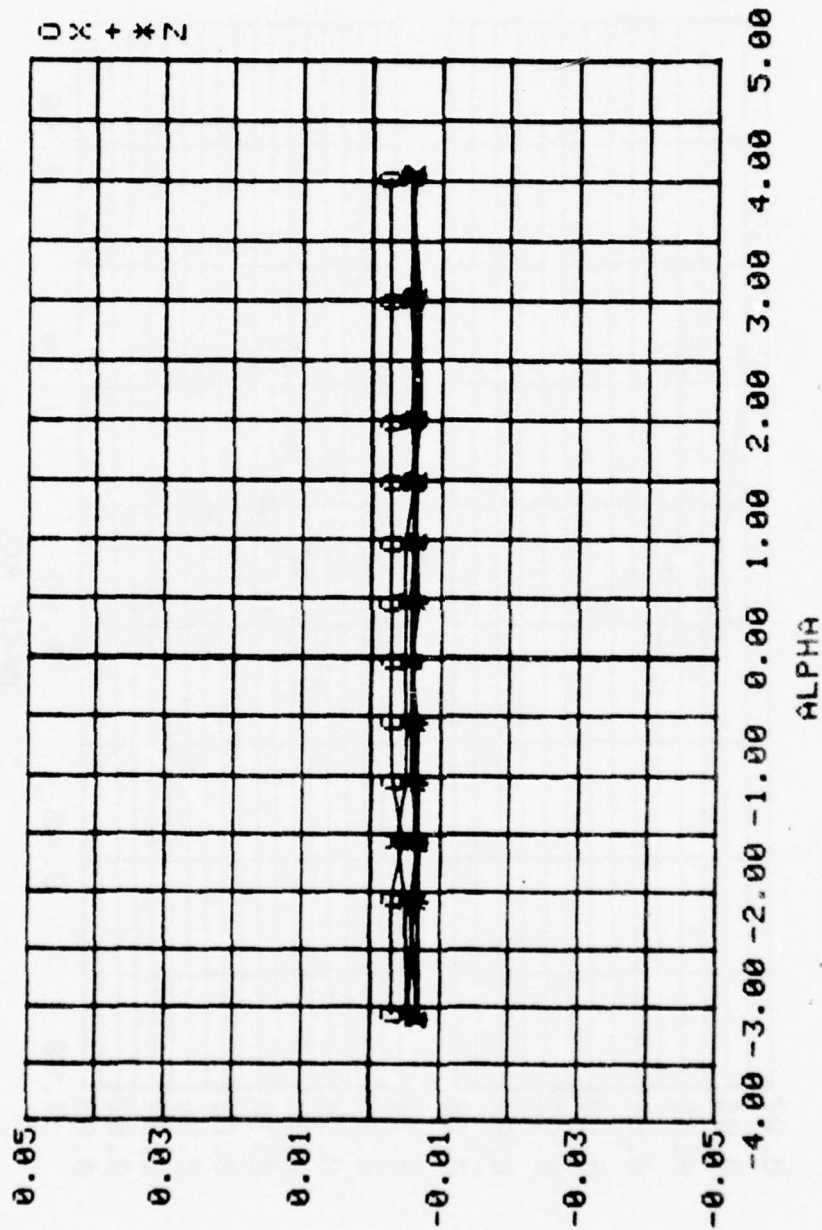


FIGURE 10-ROLLING MOMENT COEFFICIENT - BODY ALONE

C1

CRT = 0.00

SYM CONF.

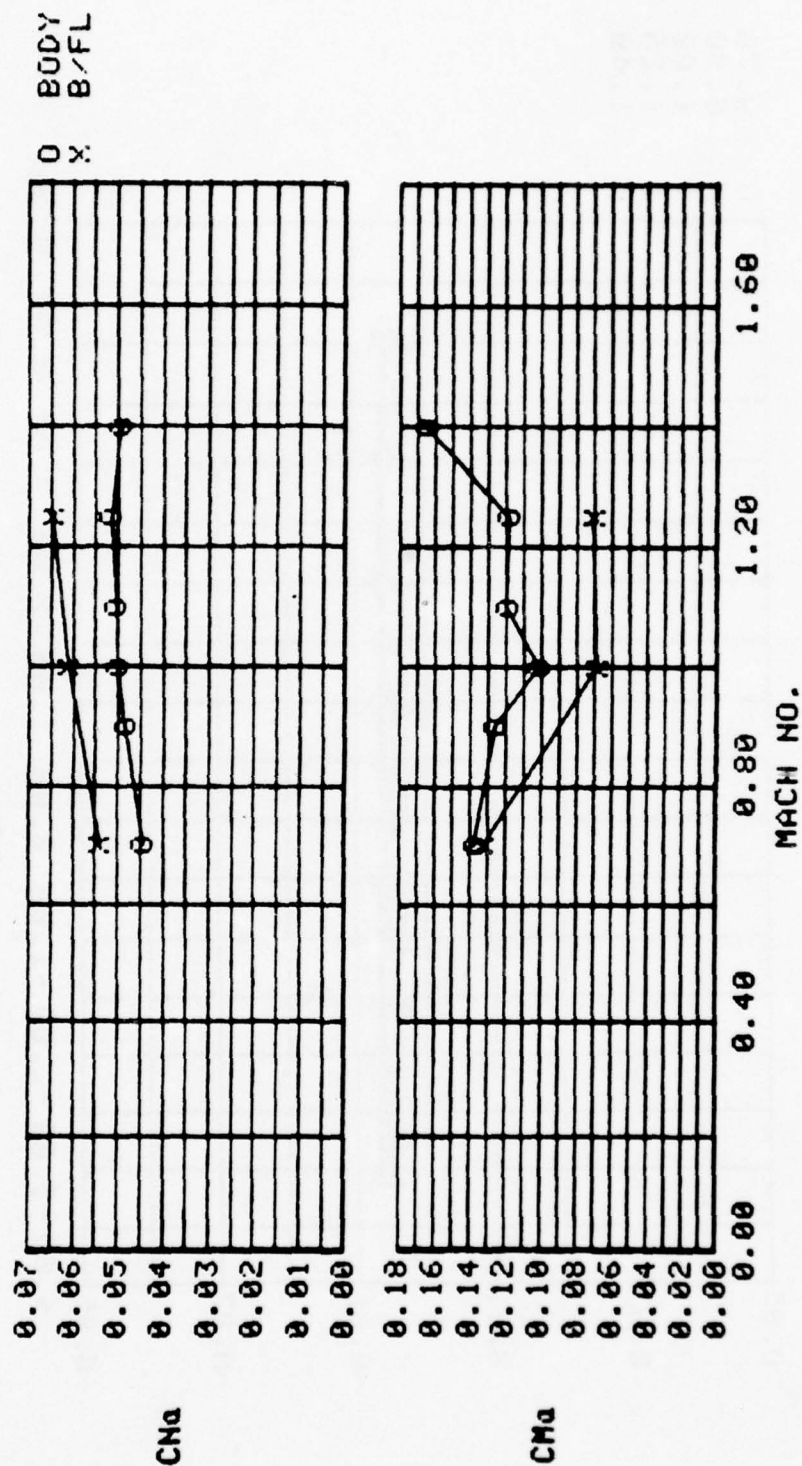


FIGURE 11-STABILITY COEFFICIENT DERIVATIVES

CRT = 0.00

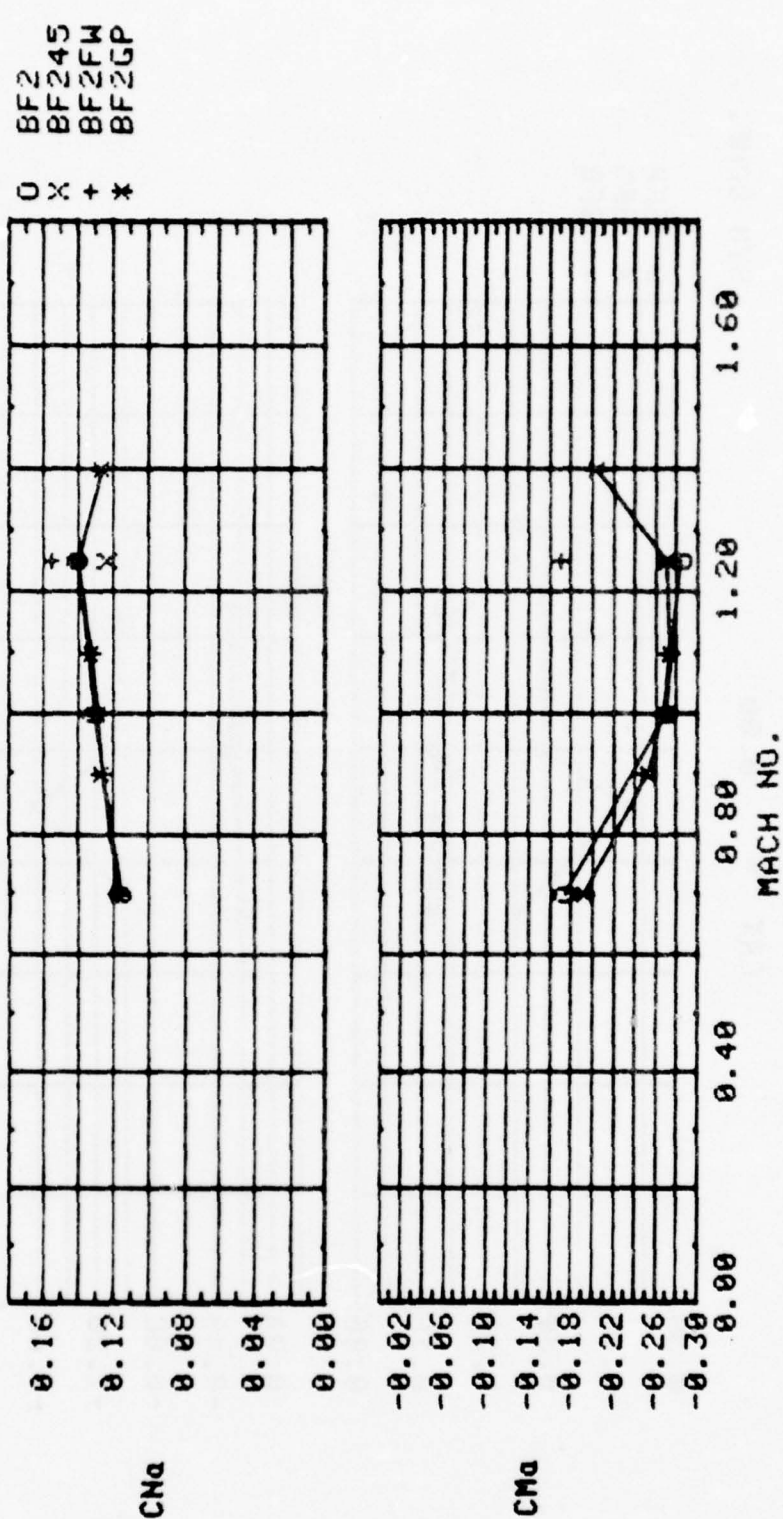


FIGURE 11-Continued

CRT = 0.000

SYM CONF.

0 BF2
X BF3
+ BF8

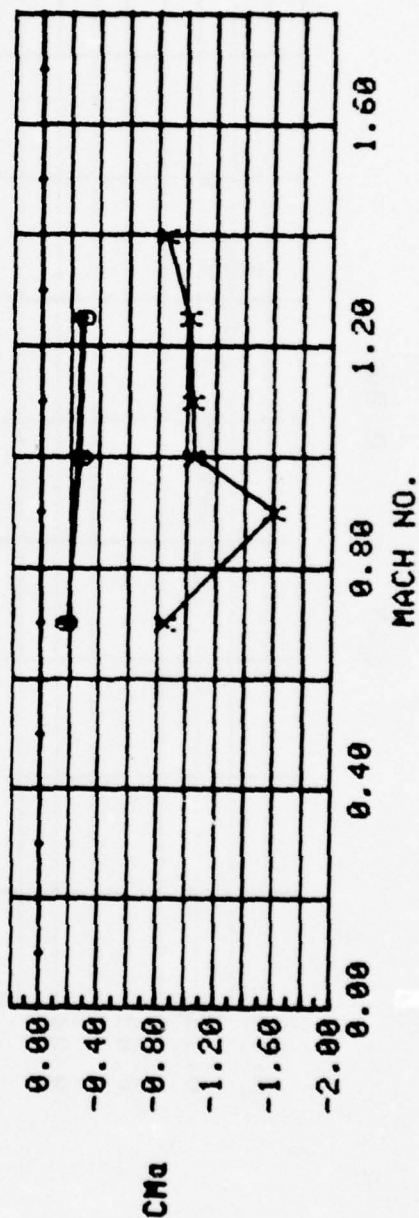
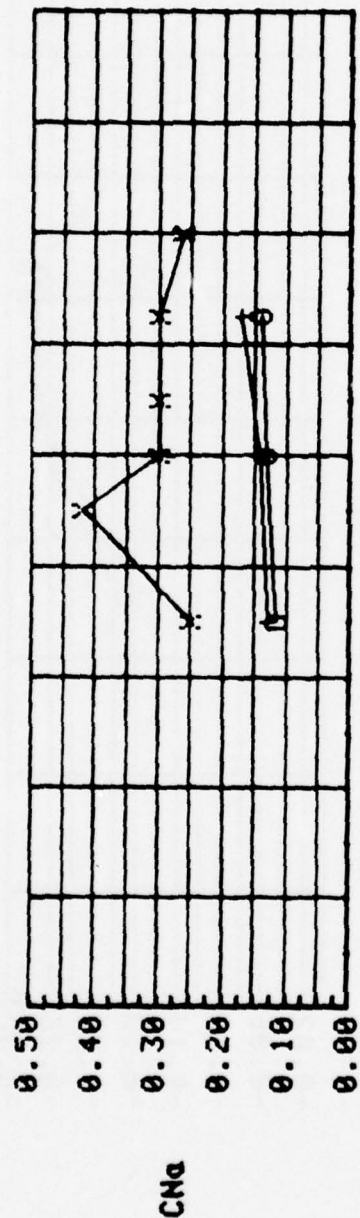


FIGURE 11-Continued

CRT = 0.00 SYM CONF.

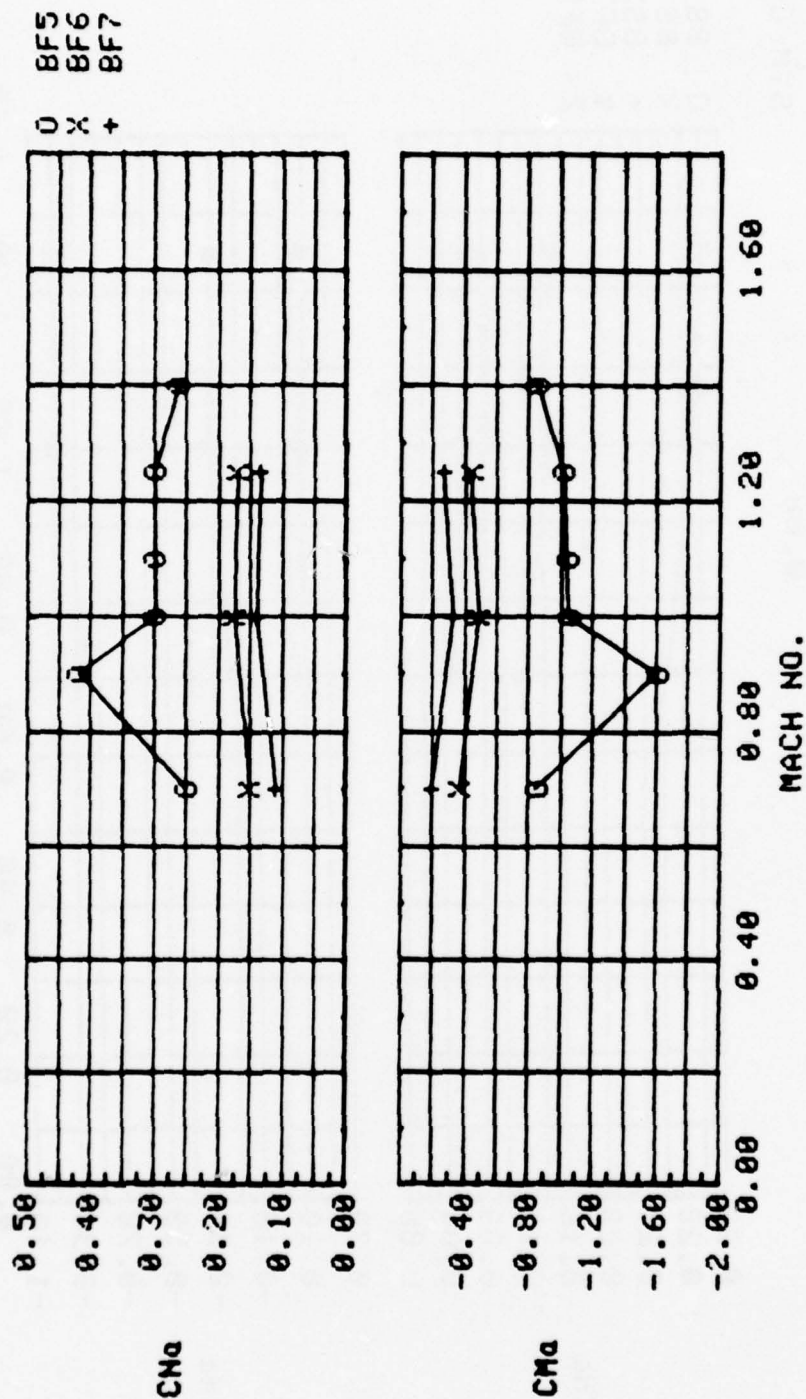


FIGURE 11-Continued

CRT = 0.00 SYM CONF.

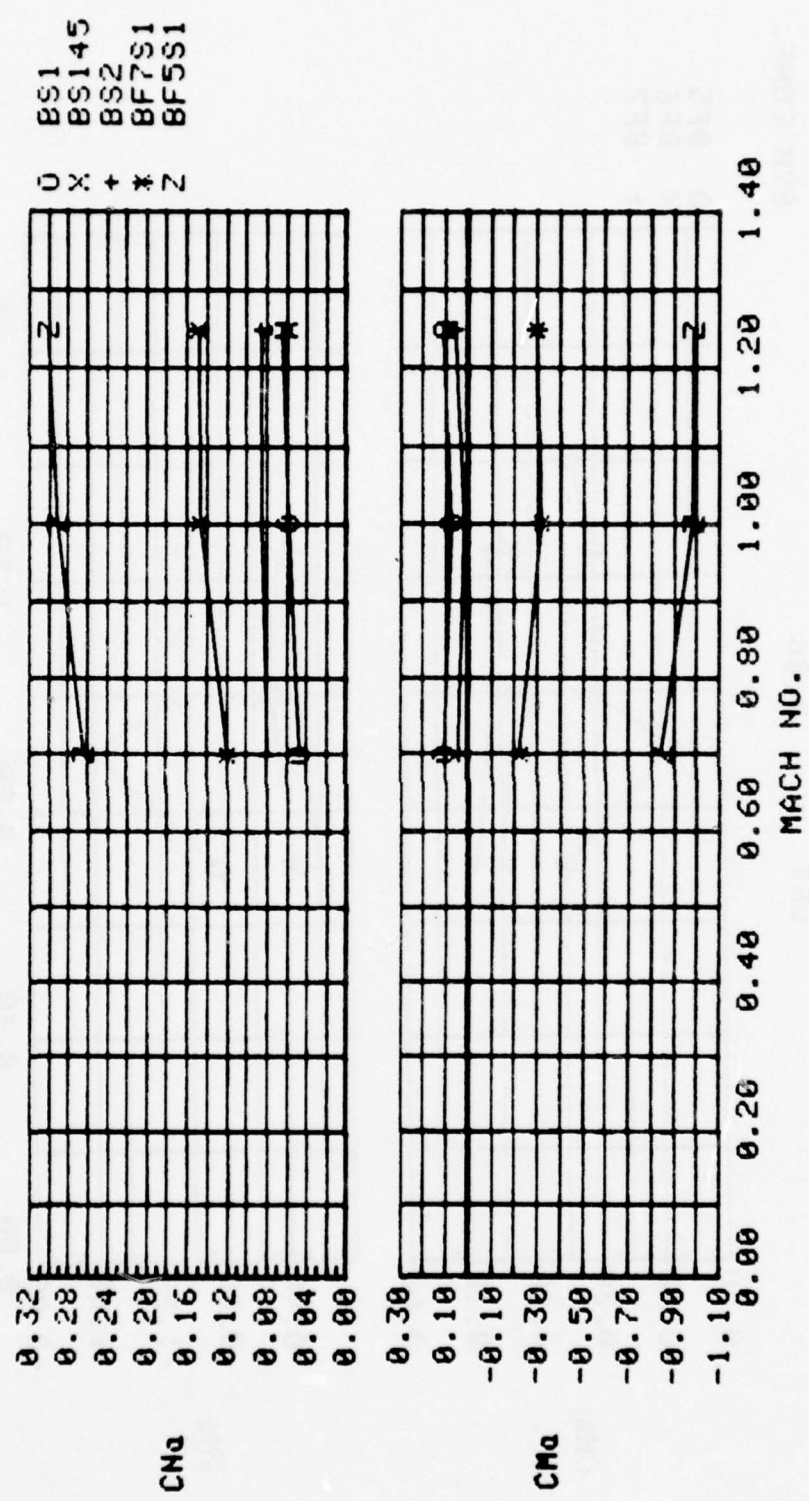


FIGURE 11-Continued

CRT = 0.00

SYM CONF.

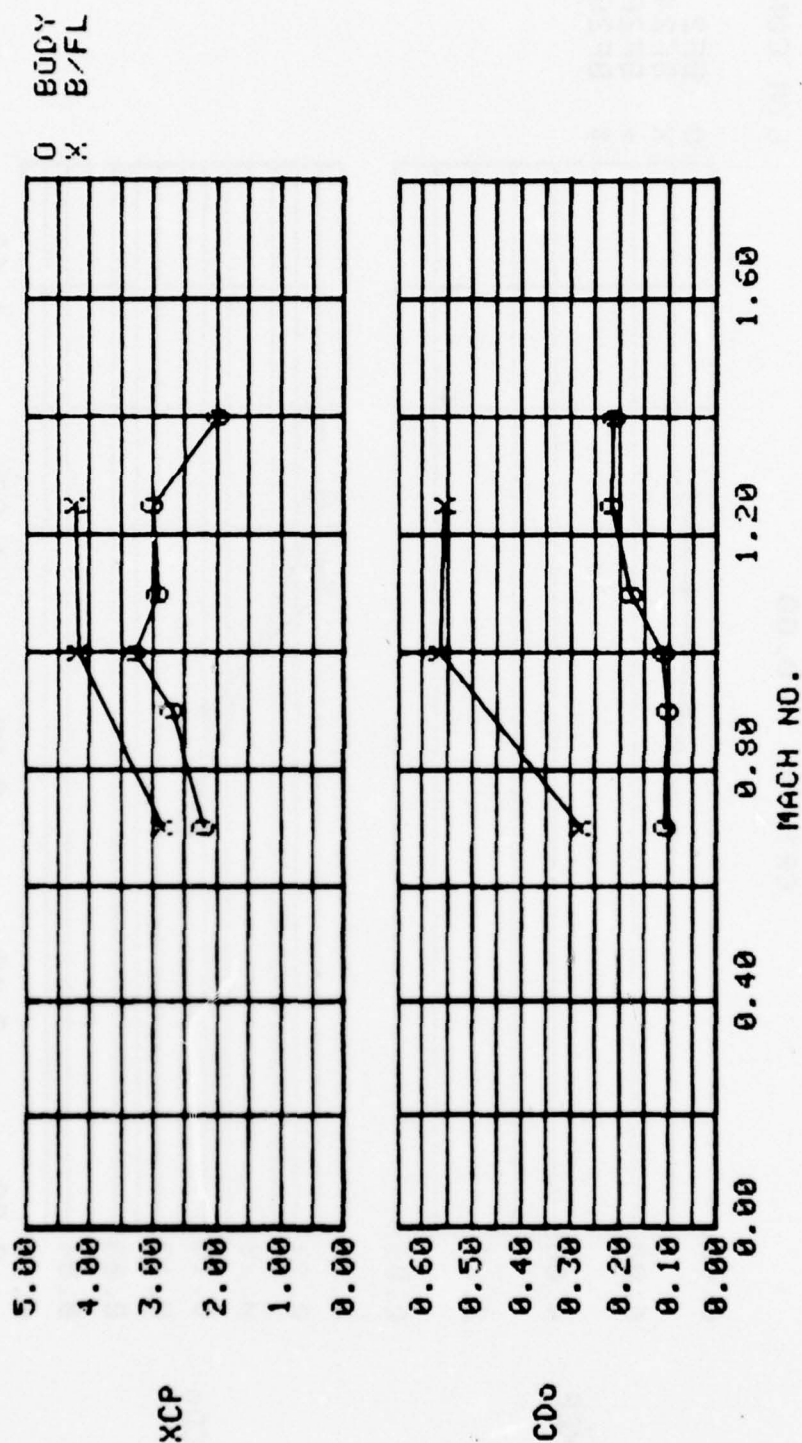


FIGURE 12-CENTER OF PRESSURE FROM NOSE AND ZERO LIFT FORE DRAG

CRT = 0.00

SYM CONF.

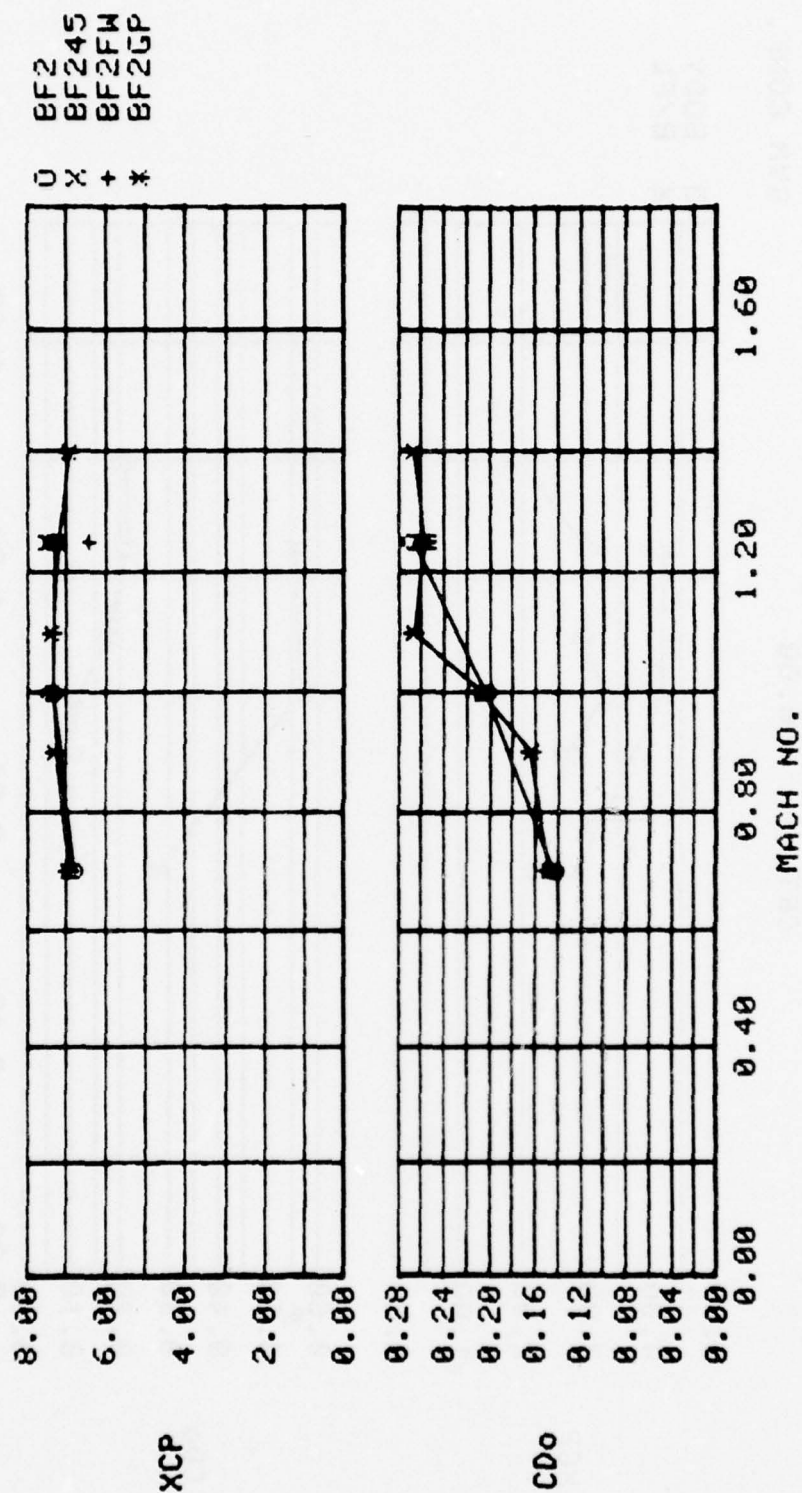


FIGURE 12-Continued

CRT = 0.00

SYM CONF.

0 BF2
X BF5
+ BF8

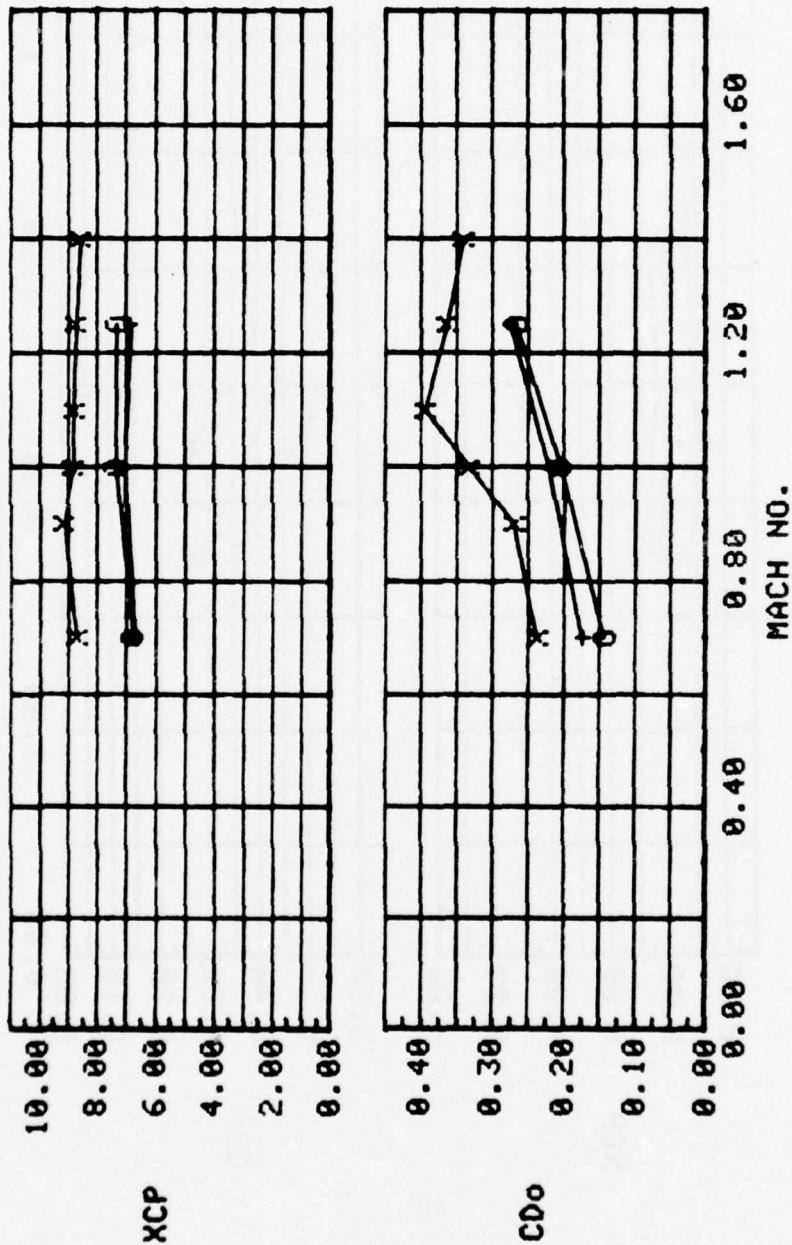


FIGURE 12-Continued

CRT = 0.00

SYM CONF.

BF5
BF6
BF7
O X +

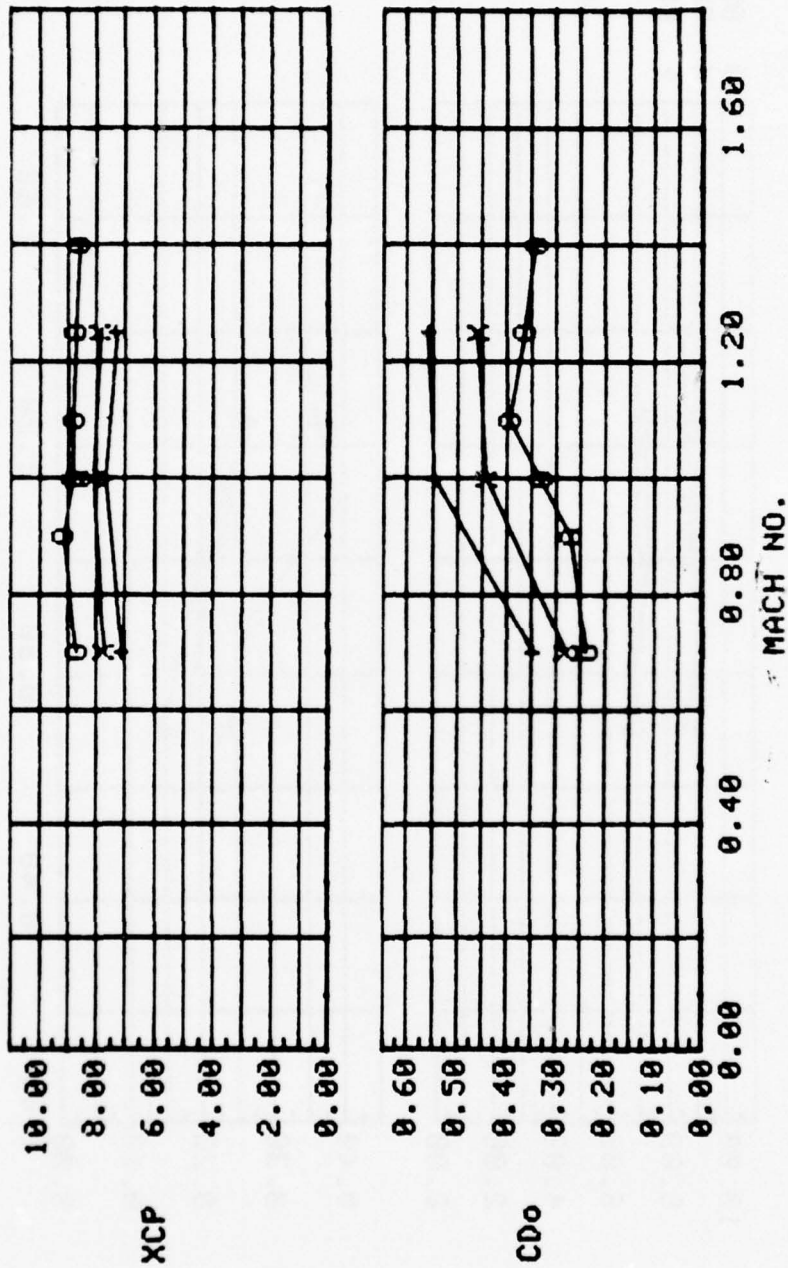


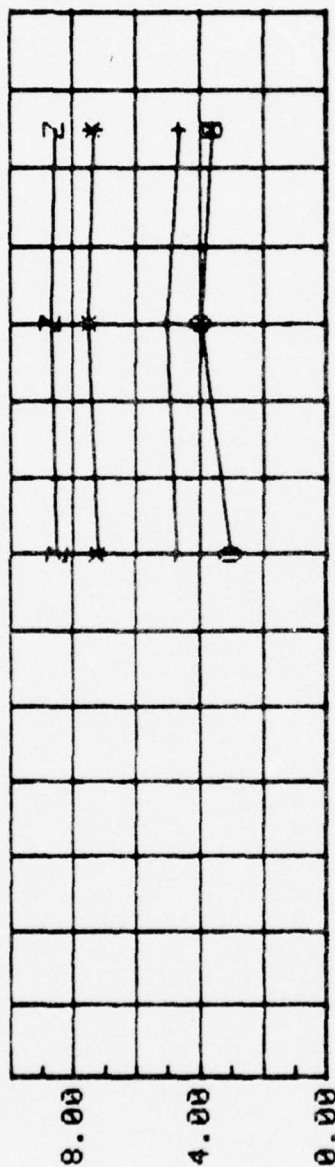
FIGURE 12-Continued

SYM CONF.

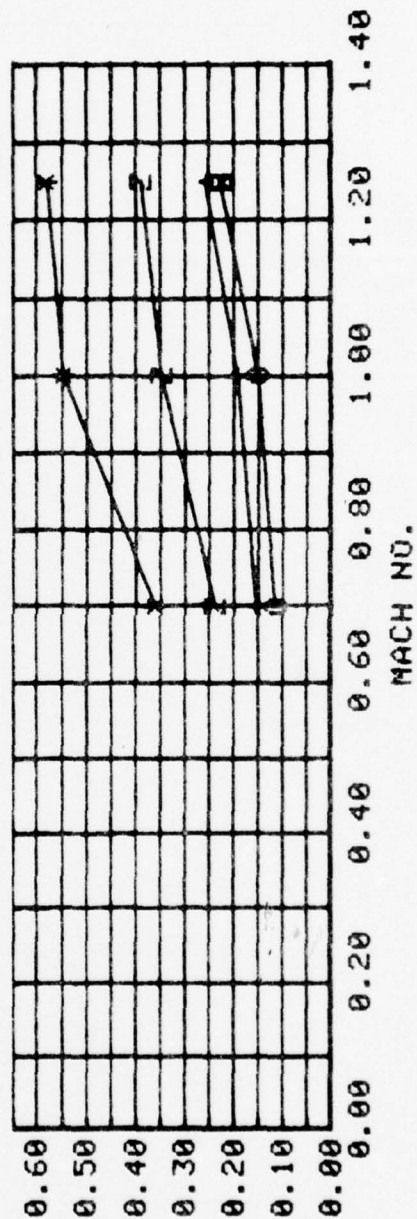
CRT = 0.00

BS1
BS145
BS2
BF791
BF591

O X + * Z



XCP



CD0

FIGURE 12-Continued

APPENDIX A

PLOTS OF BASIC DATA

INDEX OF DATA FIGURES

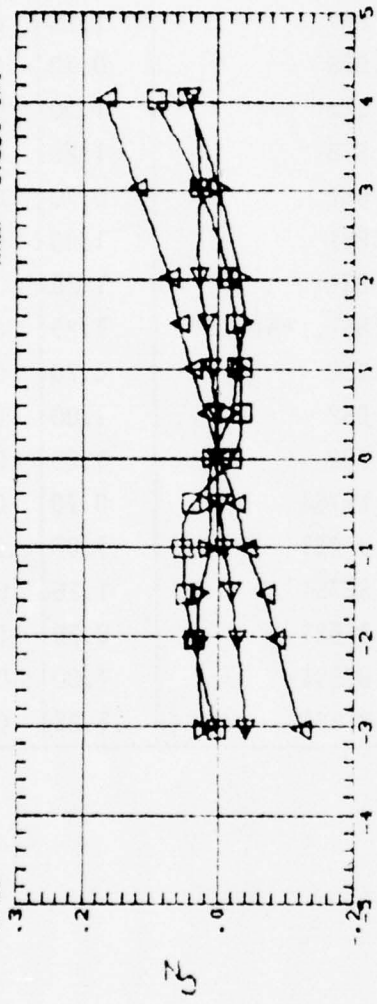
TITLE	MACH	CONDITION VARYING	PAGE
Thrust Effects on Stability Coefficients, Body Alone	0.70	CRT	4
Thrust Effects on Stability Coefficients, Body Alone	0.90	CRT	6
Thrust Effects on Stability Coefficients, Body Alone	1.00	CRT	8
Thrust Effects on Stability Coefficients, Body Alone	1.10	CRT	10
Thrust Effects on Stability Coefficients, Body Alone	1.25	CRT	12
Thrust Effects on Stability Coefficients, Body Alone	1.35	CRT	14
Thrust Effects on Stability Coefficients, Body Alone	1.40	CRT	16
Thrust Effects on Stability Coefficients, Body Flare	0.70	CRT	18
Thrust Effects on Stability Coefficients, Body Flare	1.00	CRT	20
Thrust Effects on Stability Coefficients, Body Flare	1.25	CRT	22
Thrust Effects on Stability Coefficients, BF2	0.70	CRT	24
Thrust Effects on Stability Coefficients, BF2	1.00	CRT	26
Thrust Effects on Stability Coefficients, BF2	1.25	CRT	28
Thrust Effects on Stability Coefficients, BF2, $\Phi=45^\circ$	1.25	CRT	30
Thrust Effects on Stability Coefficients, BF2 (1.65 Fwd)	1.25	CRT	32
Thrust Effects on Stability Coefficients, BF2+Grnd P1 Ref1	0.70	CRT	34
Thrust Effects on Stability Coefficients, BF2+Grnd P1 Ref1	0.90	CRT	36
Thrust Effects on Stability Coefficients, BF2+Grnd P1 Ref1	1.00	CRT	38
Thrust Effects on Stability Coefficients, BF2+Grnd P1 Ref1	1.10	CRT	40
Thrust Effects on Stability Coefficients, BF2+Grnd P1 Ref1	1.25	CRT	42
Thrust Effects on Stability Coefficients, BF2+Grnd P1 Ref1	1.40	CRT	44
Thrust Effects on Stability Coefficients, BF5	0.70	CRT	46
Thrust Effects on Stability Coefficients, BF5	0.90	CRT	48
Thrust Effects on Stability Coefficients, BF5	1.00	CRT	50
Thrust Effects on Stability Coefficients, BF5	1.10	CRT	52
Thrust Effects on Stability Coefficients, BF5	1.25	CRT	54
Thrust Effects on Stability Coefficients, BF5	1.40	CRT	56
Thrust Effects on Stability Coefficients, BF6	0.70	CRT	58
Thrust Effects on Stability Coefficients, BF6	1.00	CRT	60
Thrust Effects on Stability Coefficients, BF6	1.25	CRT	62

INDEX OF DATA FIGURES - CONCLUDED

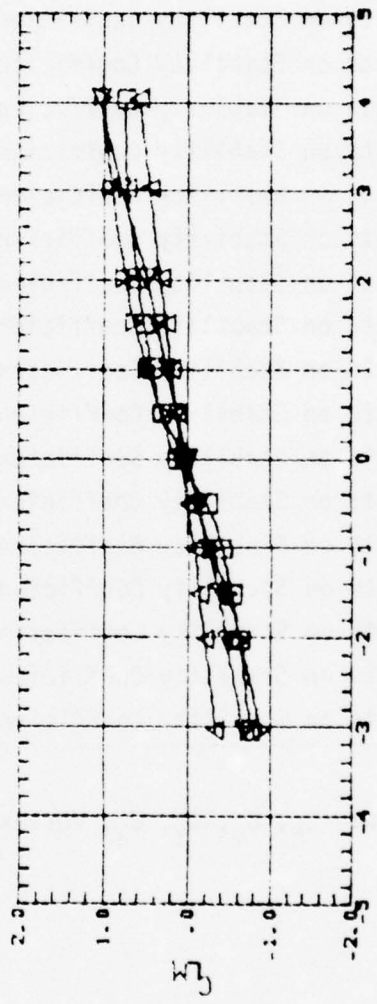
TITLE	MACH	CONDITION VARYING	PAGE
Thrust Effects on Stability Coefficients, BF7	0.70	CRT	64
Thrust Effects on Stability Coefficients, BF7	1.00	CRT	66
Thrust Effects on Stability Coefficients, BF7	1.25	CRT	68
Thrust Effects on Stability Coefficients, BF8	0.70	CRT	70
Thrust Effects on Stability Coefficients, BF8	1.00	CRT	72
Thrust Effects on Stability Coefficients, BF8	1.25	CRT	74
Thrust Effects on Stability Coefficients, BS1	0.70	CRT	76
Thrust Effects on Stability Coefficients, BS1	1.00	CRT	78
Thrust Effects on Stability Coefficients, BS1	1.25	CRT	80
Thrust Effects on Stability Coefficients, BS1, $\Phi=45^\circ$	1.25	CRT	82
Thrust Effects on Stability Coefficients, BS2	0.70	CRT	84
Thrust Effects on Stability Coefficients, BS2	1.00	CRT	86
Thrust Effects on Stability Coefficients, BS2	1.25	CRT	88
Thrust Effects on Stability Coefficients, BF7S1	0.70	CRT	90
Thrust Effects on Stability Coefficients, BF7S1	1.00	CRT	92
Thrust Effects on Stability Coefficients, BF7S1	1.25	CRT	94
Thrust Effects on Stability Coefficients, BF5S1	0.70	CRT	96
Thrust Effects on Stability Coefficients, BF5S1	1.00	CRT	98
Thrust Effects on Stability Coefficients, BF5S1	1.25	CRT	100

Plot Schedule: C_N , C_m , C_Y , C_n , versus α

SYMBOL AEDC THUSO CRT SYMBO CRT PARAMETRIC VALUES REFERENCE INFORMATION
 CRT SYMBO PHI MACH SREF LREF XMRP
 Δ .01 17.75 .00 5.97 .950 IN.
 □ 8.99 8.99 .70 1.100 IN.
 ▽ 5.830 IN.

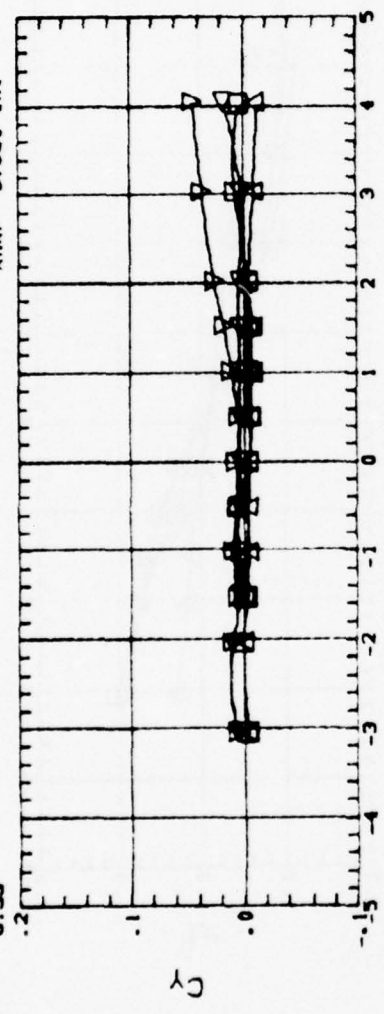


ALPHA

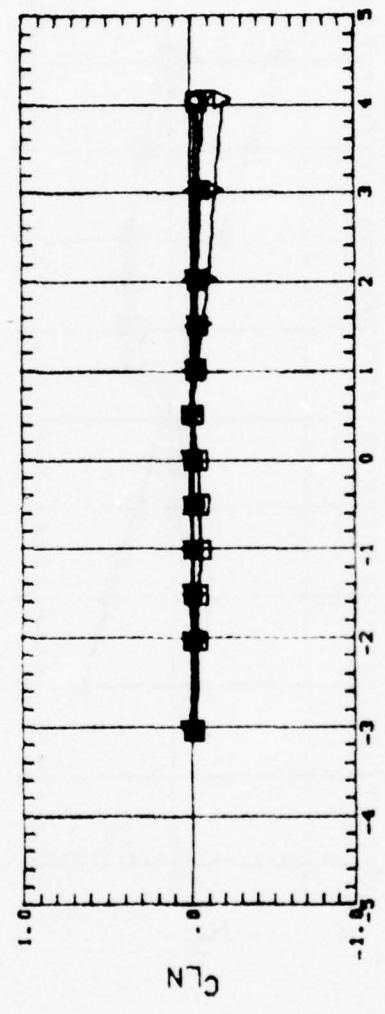


THRUST EFFECTS ON STABILITY COEFFICIENTS BODY ALONE

880801
 REFERENCE INFORMATION
 SREF .850 IN.
 LREF 1.100 IN.
 XHRP 5.830 IN.
 PARAMETRIC VALUES
 PHI .00
 MACH .70
 AEOC TMSO
 CRT SYMBOL
 .01
 17.75
 8.33
 5.97
 4



ALPHA



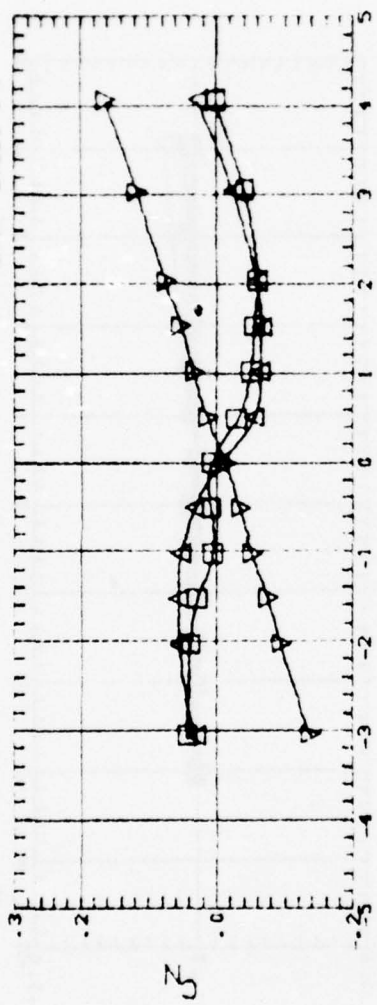
ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BODY ALONE

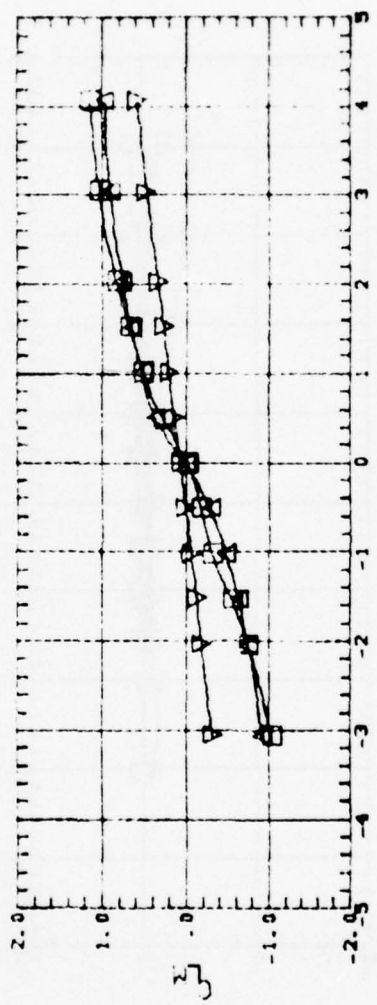
SYMBOL CRT
 Δ 8.90
 □ 6.07
 ▽ .01

AEDC TM350
 PARAMETRIC VALUES
 PHI .00
 MACH .30

880002
 REFERENCE INFORMATION
 SREF .850 60. IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.

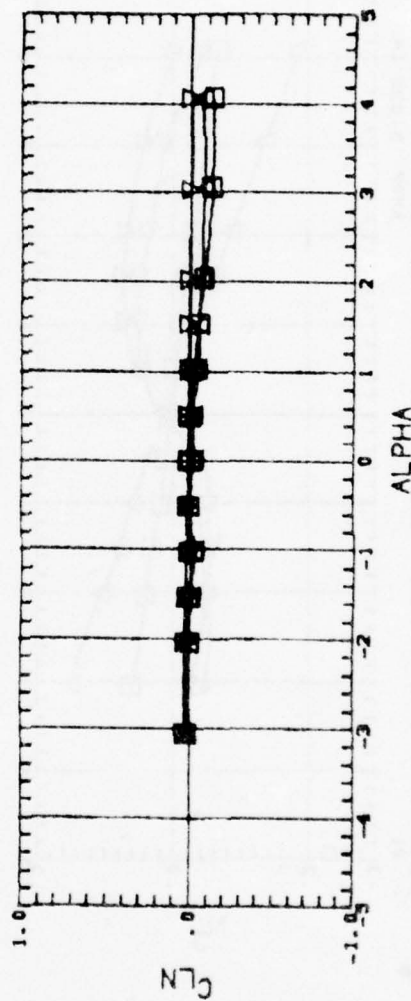
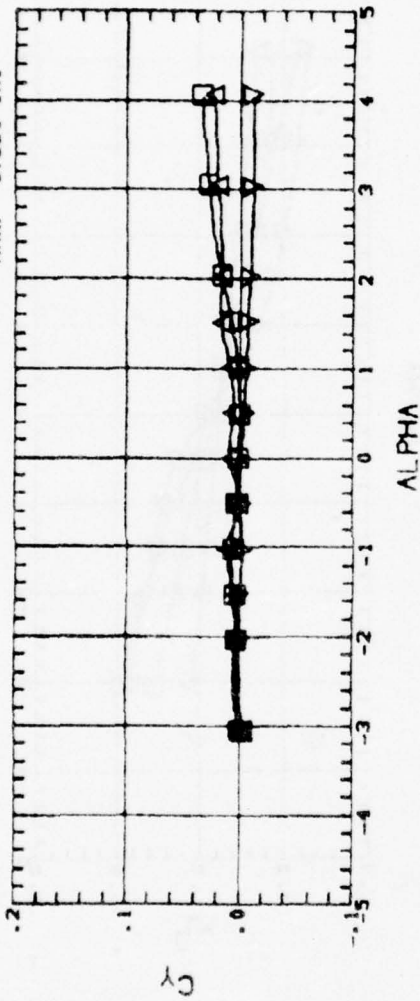


ALPHA



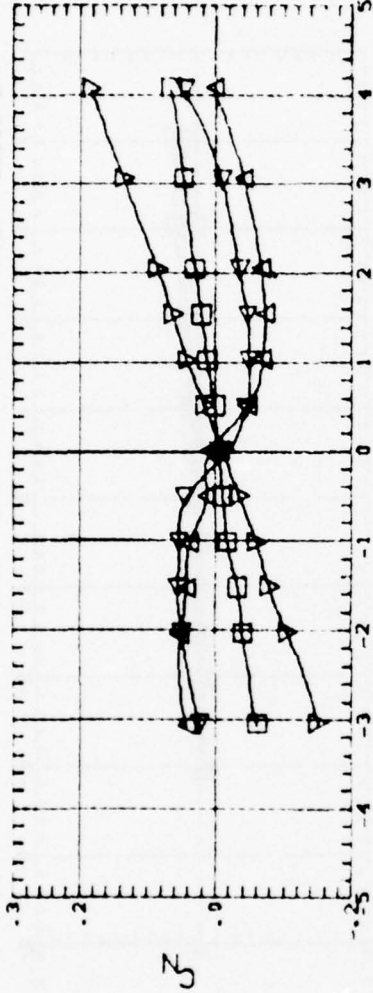
ALPHA
 THRUST EFFECTS ON STABILITY COEFFICIENTS BODY ALONE

800002
 REFERENCE INFORMATION
 SREF .850 80 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.
 PARAMETRIC VALUES
 PHI .00
 MACH .90
 AEOC THRES 0
 CRT
 8.80
 6.07
 .01
 SYMBOL
 ▲ □
 ▲ □

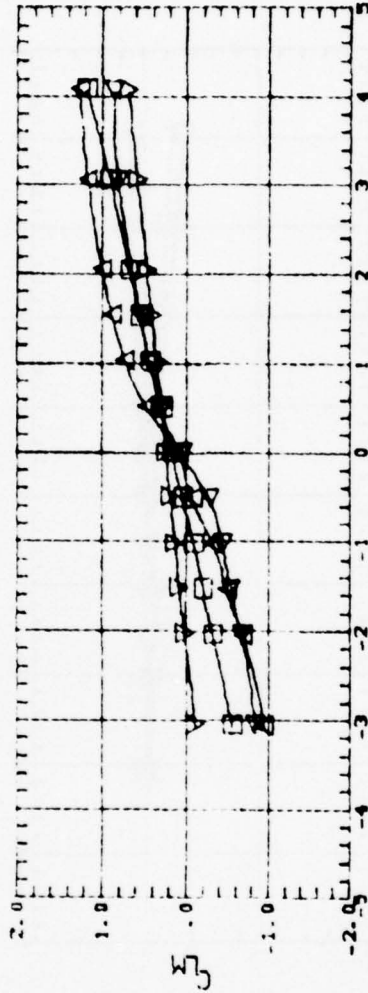


THRUST EFFECTS ON STABILITY COEFFICIENTS BODY ALONE

SYMBOL AEDC TN350 CRT SYMBOL CRT PARAMETRIC VALUES REFERENCE INFORMATION 960003
 △ 6.08 10.72 △ 10.72 PHI .00 SREF .950 SQ. IN.
 □ 2.55 .01 □ .01 MACH 1.00 LREF 1.100 IN.
 ▽ XMRP 5.830 IN.



ALPHA



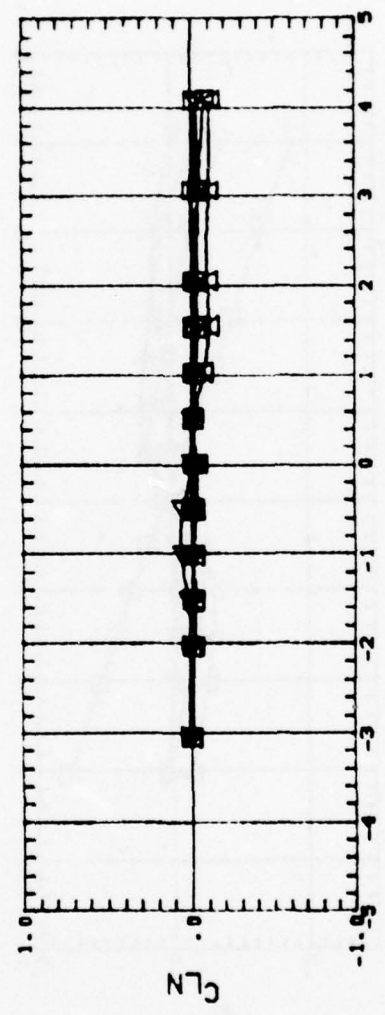
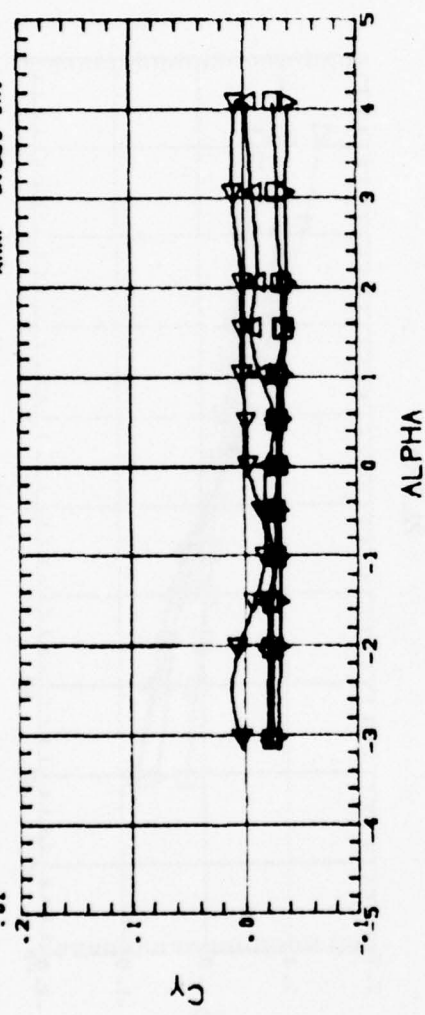
THRUST EFFECTS ON STABILITY COEFFICIENTS BODY ALONE
 ALPHA

AEDC TMS50
 CRT SYMBOL CRT
 8.00 4 10.72
 2.55
 .01
 SYMBOL
 ▲
 □
 ▲

PARAMETRIC VALUES
 PHI .00
 MACH 1.00

REFERENCE INFORMATION
 GREF .930 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.

880003

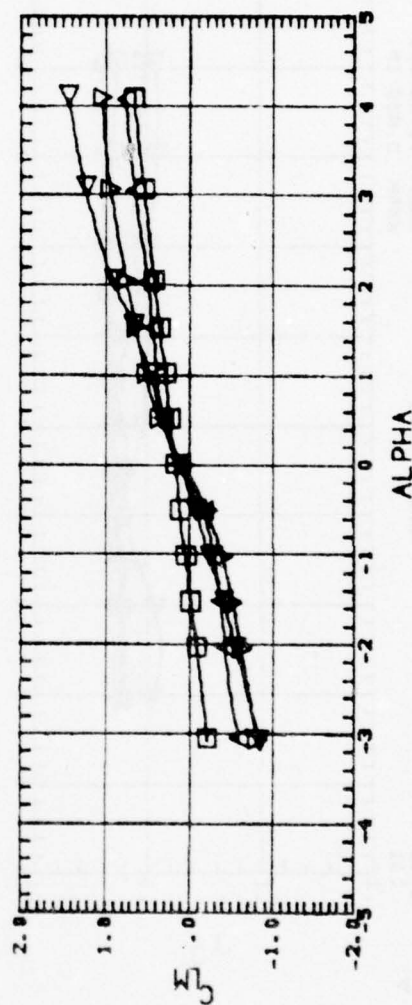
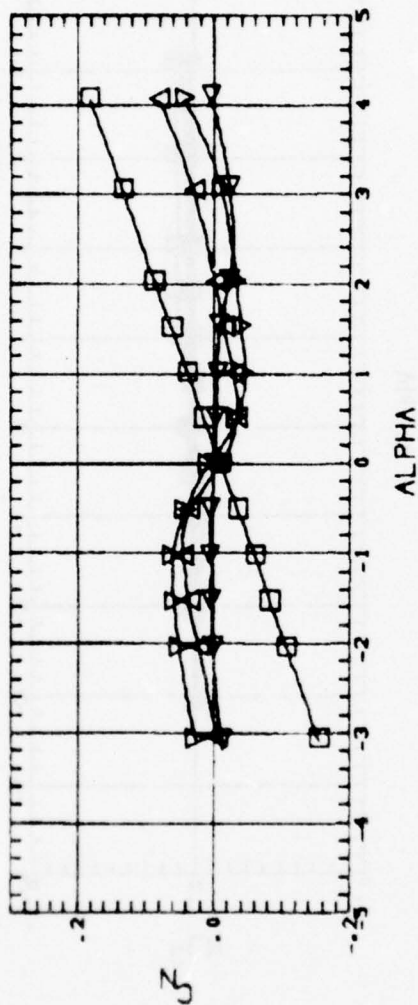


THRUST EFFECTS ON STABILITY COEFFICIENTS BODY ALONE
 ALPHA

SYMBOL CRT SYMBOL CRT
 A 9.10 4
 □ .01
 V 6.08

AEDC TH030
 CRT 2.55
 PHI .00
 MACH 1.10

880004
 REFERENCE INFORMATION
 GREF .850 80 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.



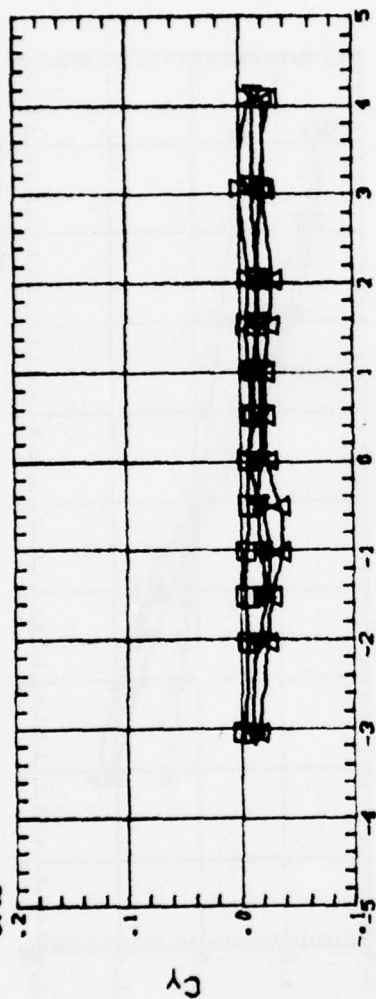
THRUST EFFECTS ON STABILITY COEFFICIENTS BODY ALONE

880084
 REFERENCE INFORMATION
 SREF .850 IN.
 LREF 1.100 IN.
 XMRP 5.838 IN.

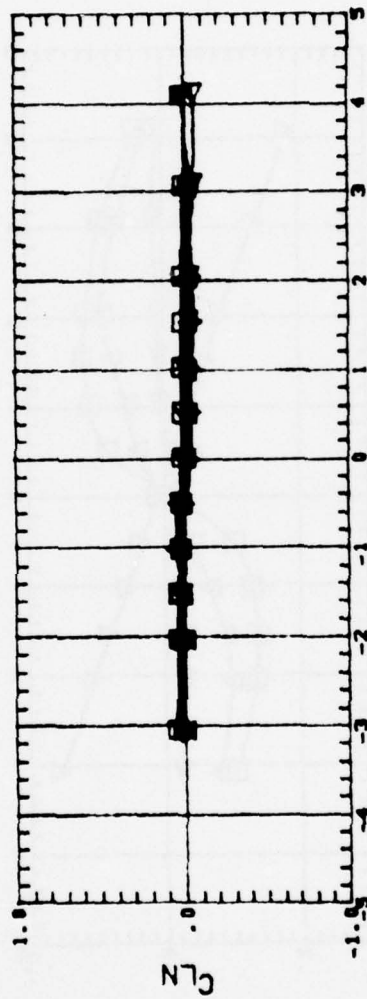
PARAMETRIC VALUES
 PHI .00
 MACH 1.10

AEDC TMS50
 CRT SYMBOL CRT
 9.10 4 2.55
 .01
 6.08

SYMBOL
 4
 4
 4



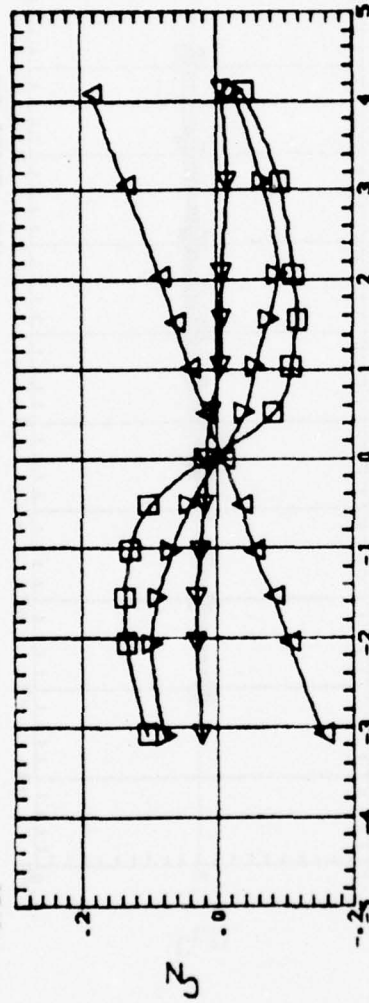
ALPHA



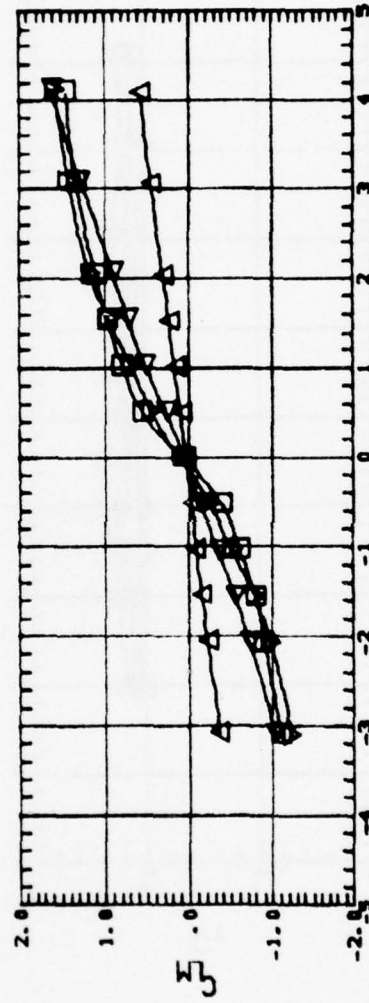
ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BODY ALONE

SYMBOL AEDC TH0358 CRT SYMBO CRT PARAMETRIC VALUES REFERENCE INFORMATION
 .01 7.15 4.21 PHI MACH SREF LREF XMRP
 7.15 4.21 2.51 .00 1.25 .850 80.1M.
 4.21 2.51 1.25 1.00 1.100 IN.
 2.51 1.25 1.00 1.100 IN.
 1.25 1.00 1.100 IN.
 1.00 1.100 IN.
 1.100 IN.



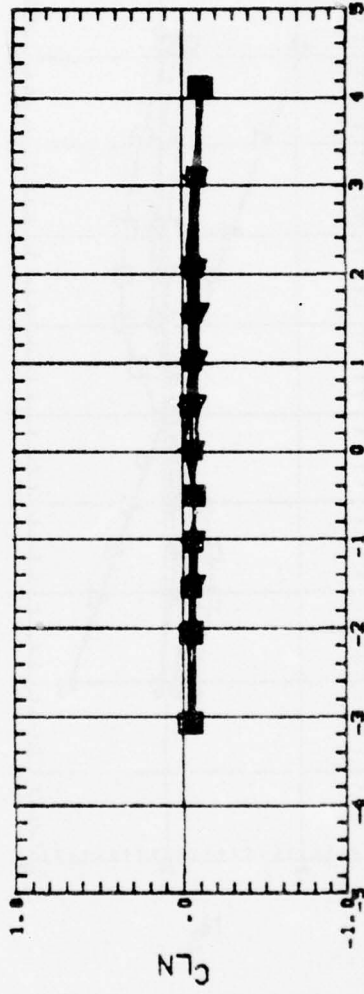
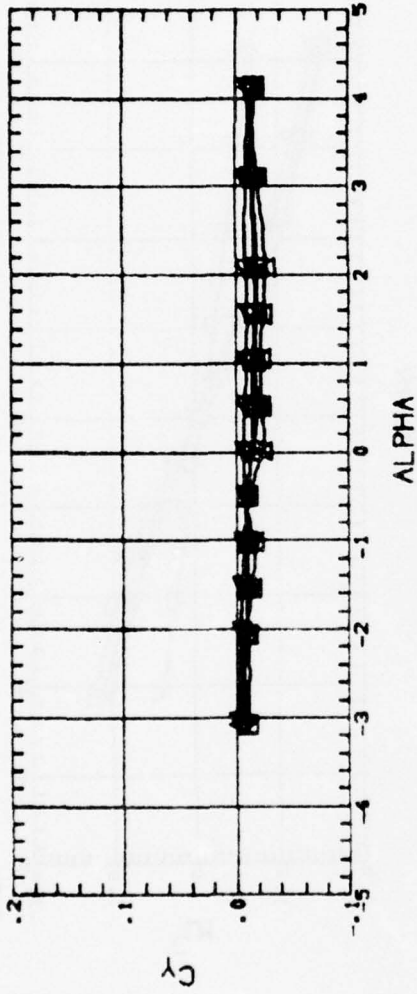
ALPHA



THRUST EFFECTS ON STABILITY COEFFICIENTS BODY ALONE
 ALPHA

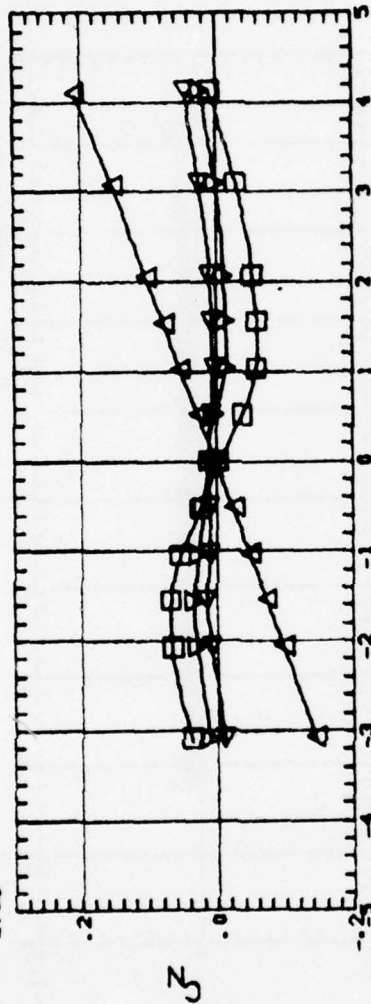
W29018

SYMBOL AEDC TH358 CRT SYMBO CRT PARAMETRIC VALUES REFERENCE INFORMATION
 △ 4.11 .01 △ .00 PHI SREF .808 80.1M.
 □ 2.57 MACH 1.35 LREF 1.108 IN.
 △ 2.58 XMRP 5.808 IN.

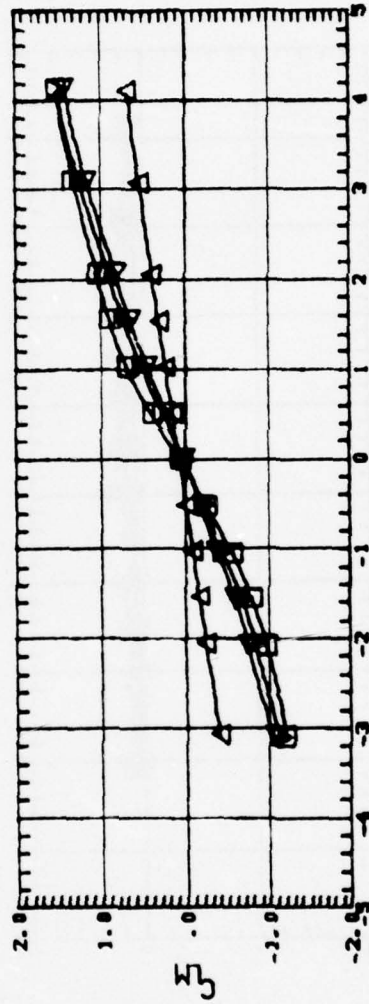


THRUST EFFECTS ON STABILITY COEFFICIENTS BODY ALONE

MS0087
 REFERENCE INFORMATION
 GREF .850 80-IN.
 LREF 1.100 IN.
 XMRP 5.030 IN.
 PARAMETRIC VALUES
 PHI .00
 MACH 1.40
 CRT 2.42
 AEDC TH050
 CRT SYMBOL
 .81
 4
 4.87
 2.89
 SYMBOL
 Δ
 □
 ▽



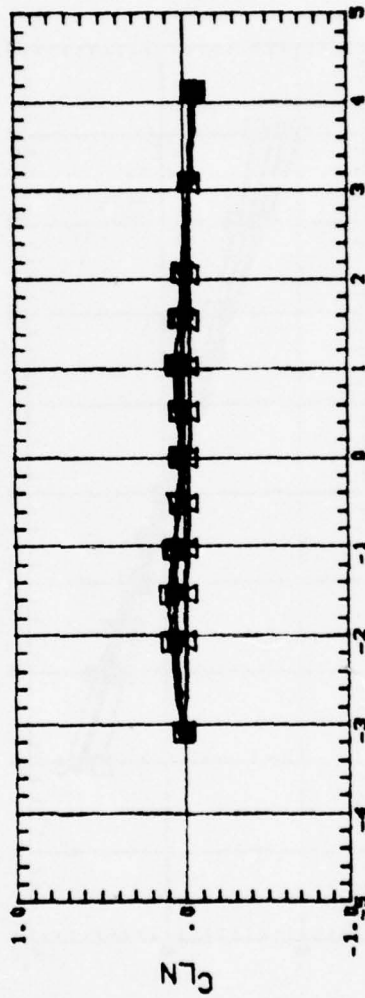
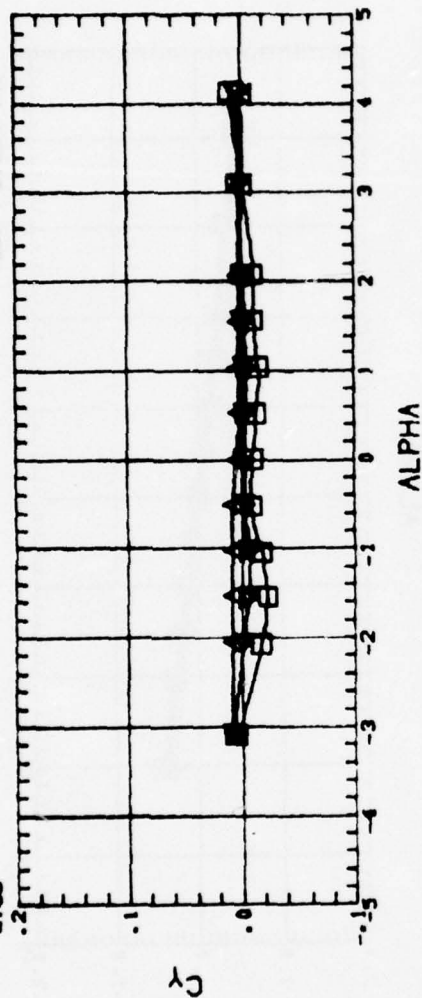
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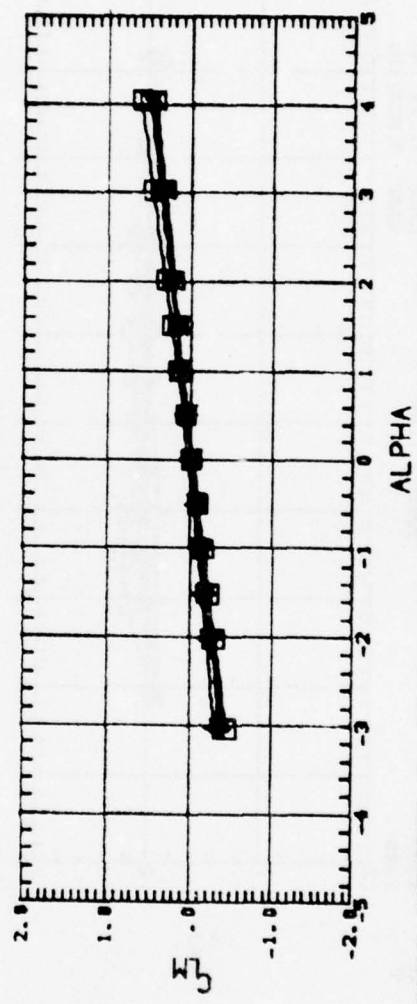
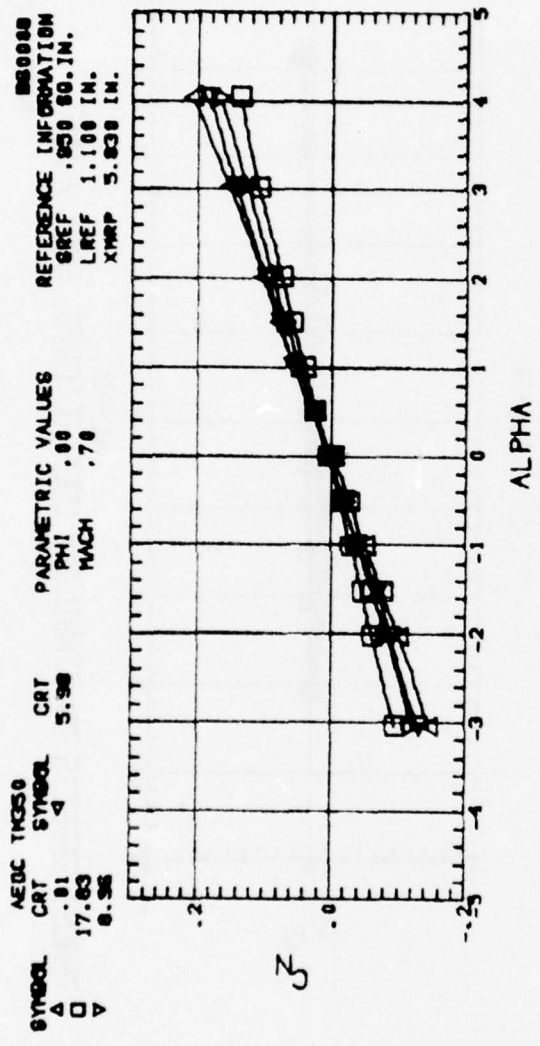
THRUST EFFECTS ON STABILITY COEFFICIENTS BODY ALONE
 ALPHA

88987

SYMBOL	AEDC THROSB	PARAMETRIC VALUES	REFERENCE INFORMATION
△	CRT	PHI .00	SREF .858 IN.
□	4	MACH 1.46	LREF 1.108 IN.
▽	.81		XMRP 5.838 IN.
	4.07		
	2.68		



THRUST EFFECTS ON STABILITY COEFFICIENTS BODY ALONE

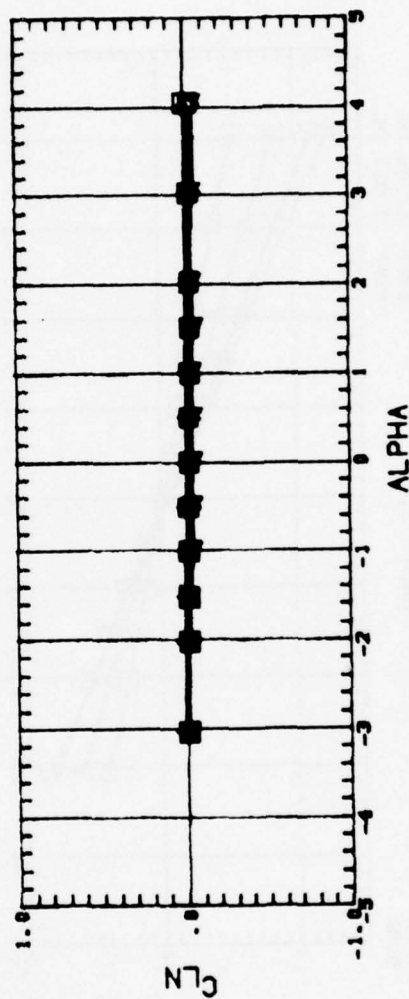
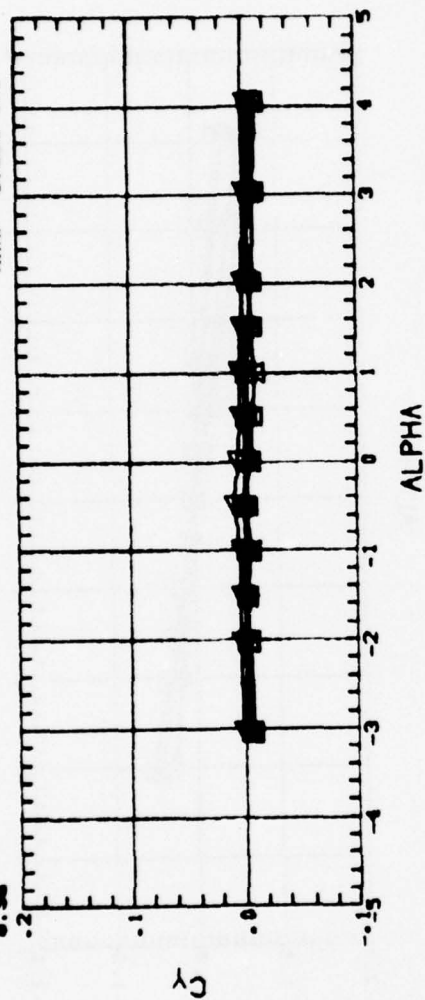


THRUST EFFECTS ON STABILITY COEFFICIENTS BODY FLARE
 ALPHA

SYMBOL Δ \square
 AEDC TNO50 CRT SYMBOL CRT
 .01 4 5.58
 17.63
 8.58

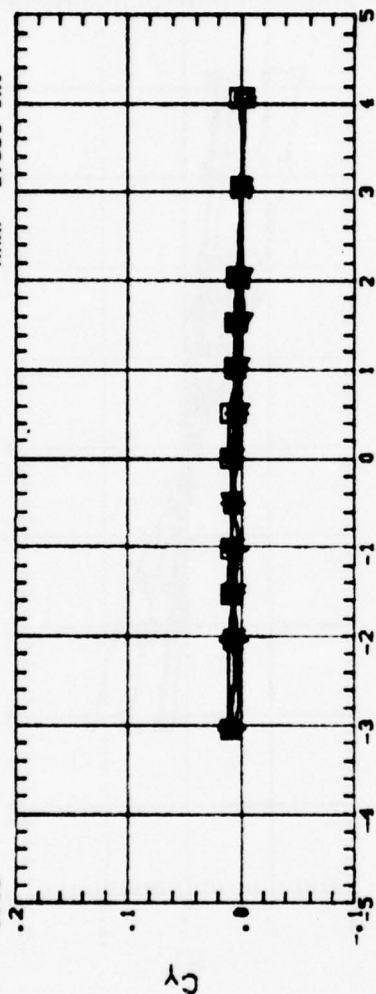
PARAMETRIC VALUES
 PHI .00
 MACH .70

REFERENCE INFORMATION
 GREF .838 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.

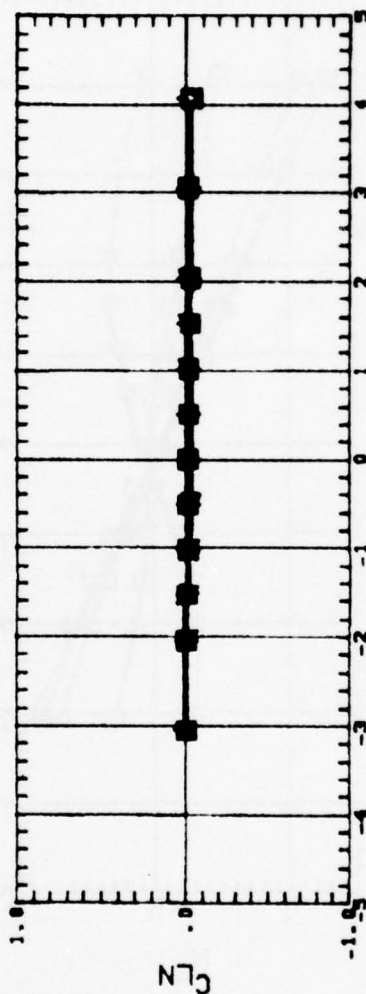


THRUST EFFECTS ON STABILITY COEFFICIENTS BODY FLARE

SYMBOL Δ \square
 AEDC TR350
 CRT .01
 SYMBOL Δ
 CRT 2.51
 PARAMETRIC VALUES
 PHI .00
 MACH 1.00
 REFERENCE INFORMATION
 GREF .930 IN.
 LREF 1.100 IN.
 XMRP 5.630 IN.



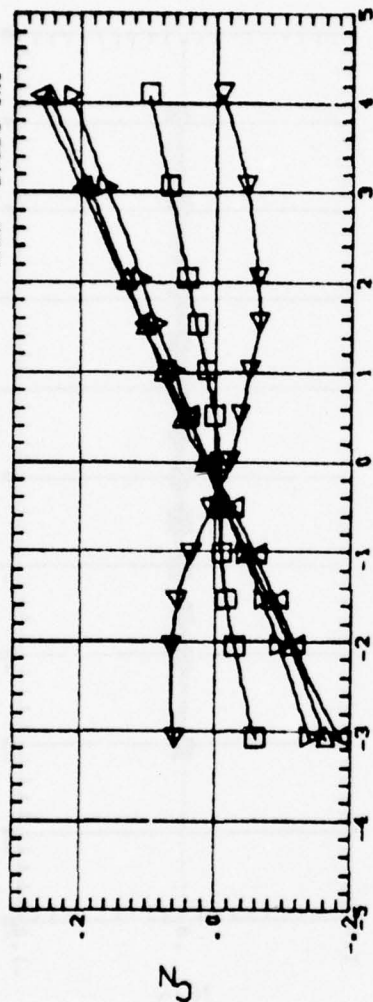
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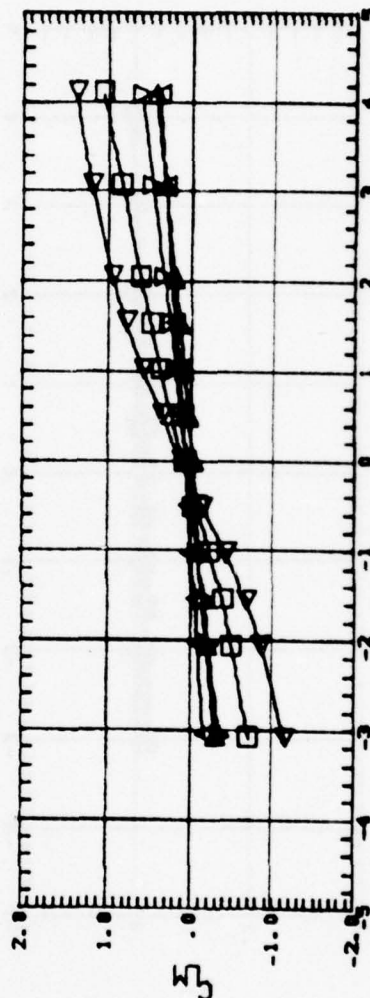
ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BODY FLARE

SYMBOL AEDC THUS0 CRT PARAMETRIC VALUES REFERENCE INFORMATION
 Δ CRT SYMBOL PHI GREF 8000 80 IN.
 7.11 Δ 0.00 LREF 1.100 IN.
 4.15 ▽ 2.46 XMRP 5.838 IN.



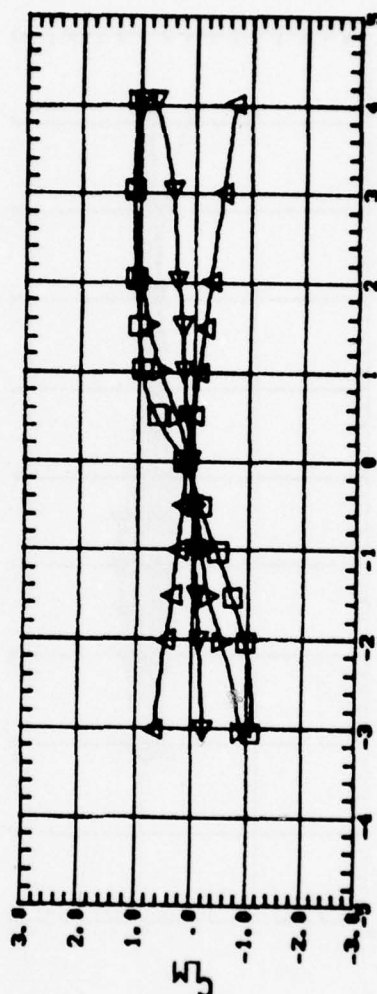
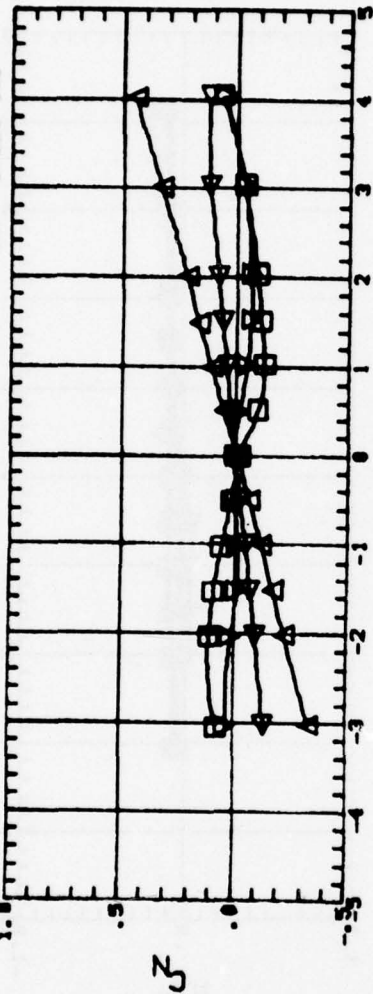
ALPHA



ALPHA

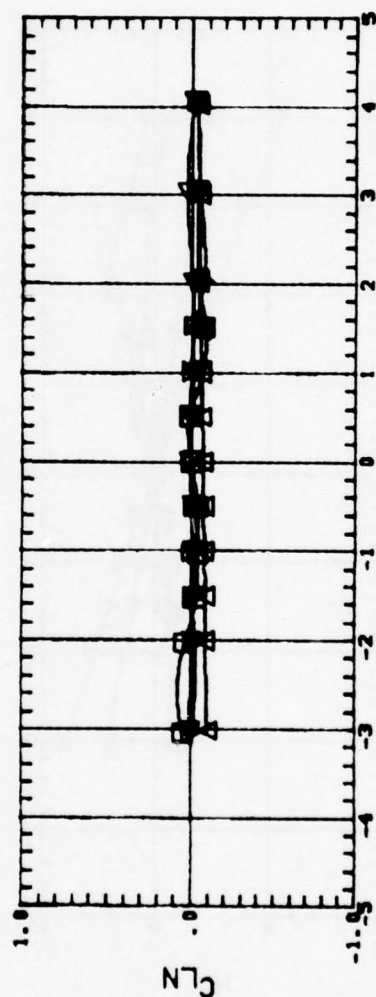
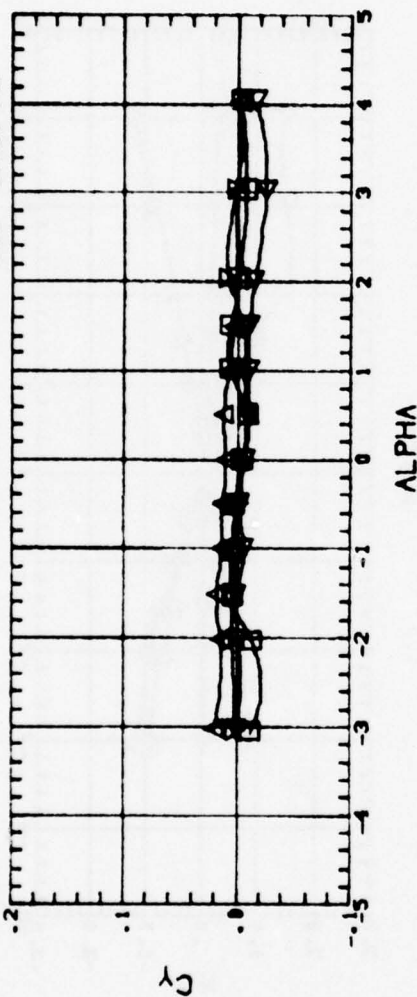
THRUST EFFECTS ON STABILITY COEFFICIENTS BODY FLARE

Symbol



ALPHA
THRUST EFFECTS ON STABILITY COEFFICIENTS BF2

AEDC TK330		REFERENCE INFORMATION	
SYMBOL	CRT SYMBOL	PARAMETRIC VALUES	REF
△	.01	PHI .00	SREF .950 80. IN.
□	11.73	MACH .70	LREF 1.100 IN.
▽	8.83		XMRP 5.830 IN.

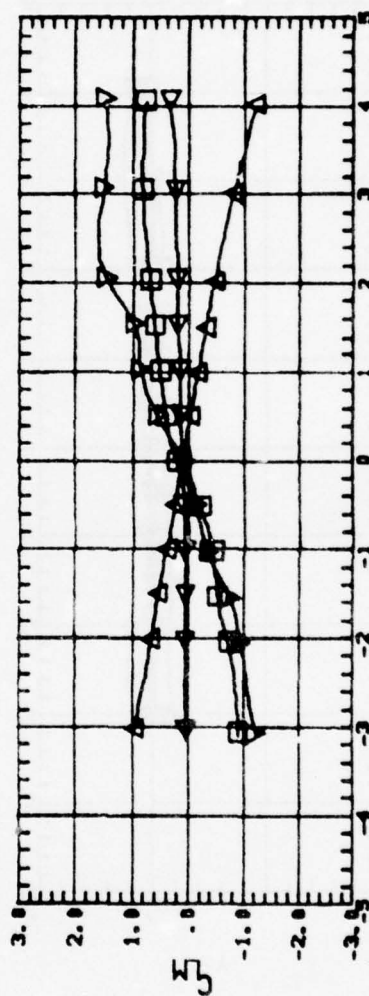
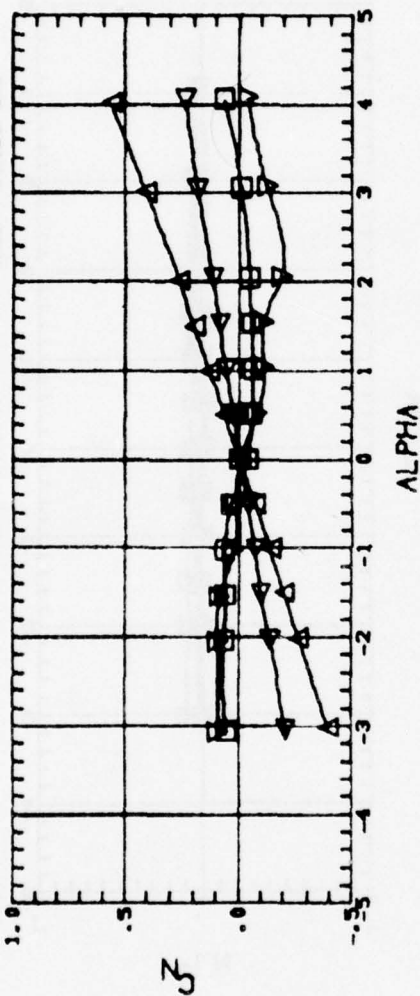


ALPHA
THRUST EFFECTS ON STABILITY COEFFICIENTS B/F2

SYMBOL CRT SYMBOI CRT
 A .81
 □ 11.91
 ▽ 5.96

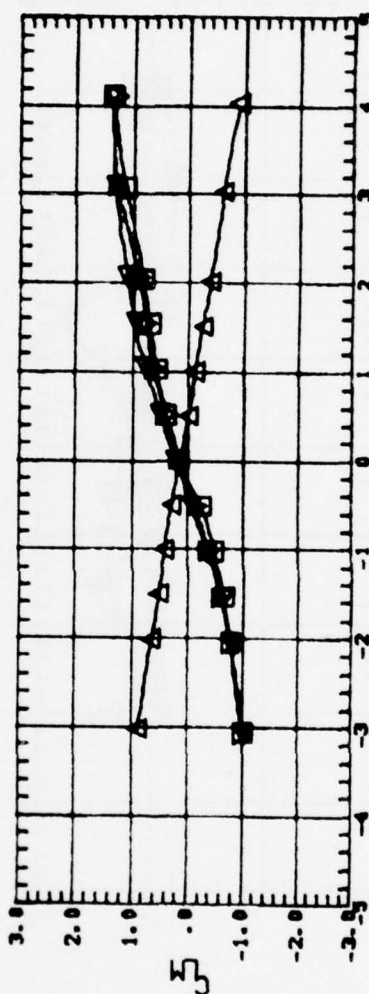
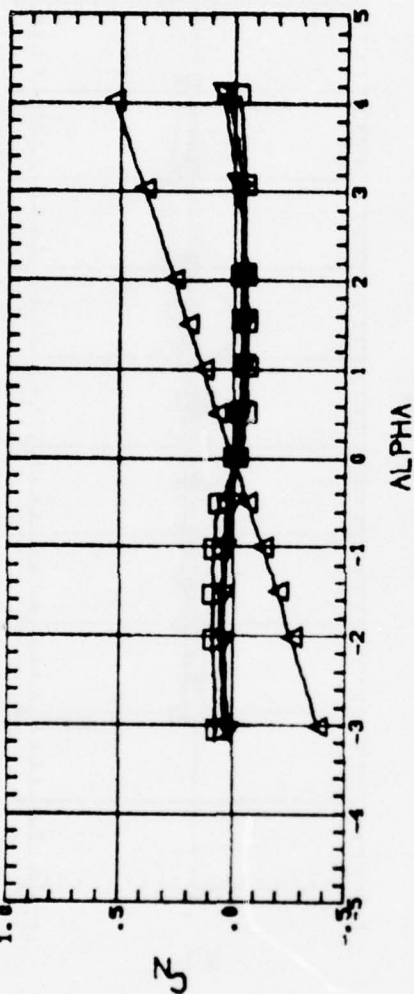
AEDC TH0350
 CRT 2.49
 SYMBOI
 PHI .00
 MACH 1.00

BS0012
 REFERENCE INFORMATION
 GREF .850 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.



THRUST EFFECTS ON STABILITY COEFFICIENTS BF2

SYMBOL AEDC TH3510 CRY SYMBOL CRY PARAMETRIC VALUES REFERENCE INFORMATION
 Δ .81 2.48 Δ PHI .80 MACH 1.25 SREF .850 IN.
 \square 7.10 \square MACH 1.25 LREF 1.100 IN.
 ∇ 4.14 ∇ XMRP 5.830 IN.



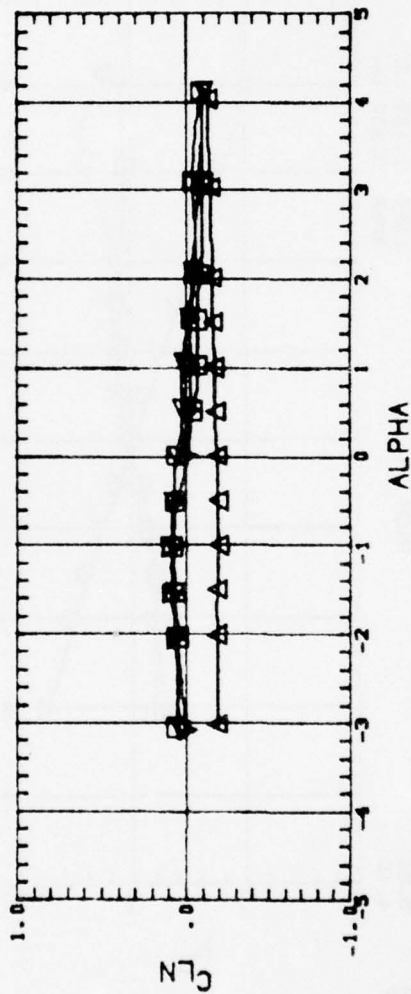
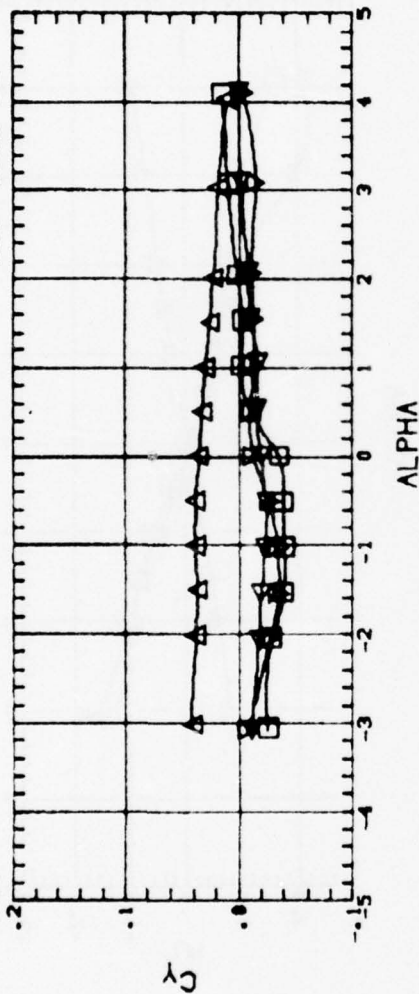
THRUST EFFECTS ON STABILITY COEFFICIENTS BF2

AEDC TMS50
 CRT SYMBOL CRT
 .01 4 2.00
 7.10
 4.14
 SYMBOL
 Δ
 □
 ▲

PARAMETRIC VALUES
 PHI .00
 MACH 1.25

REFERENCE INFORMATION
 SREF .850 IN.
 LREF 1.100 IN.
 XHRP 5.830 IN.

BS0013



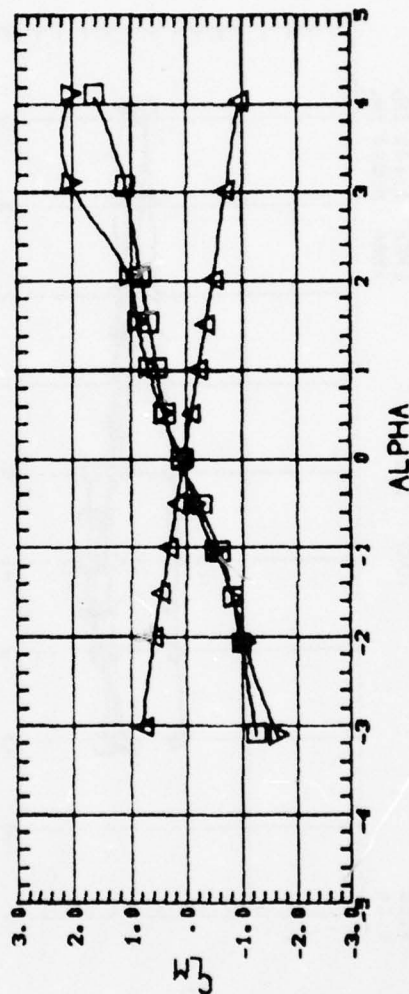
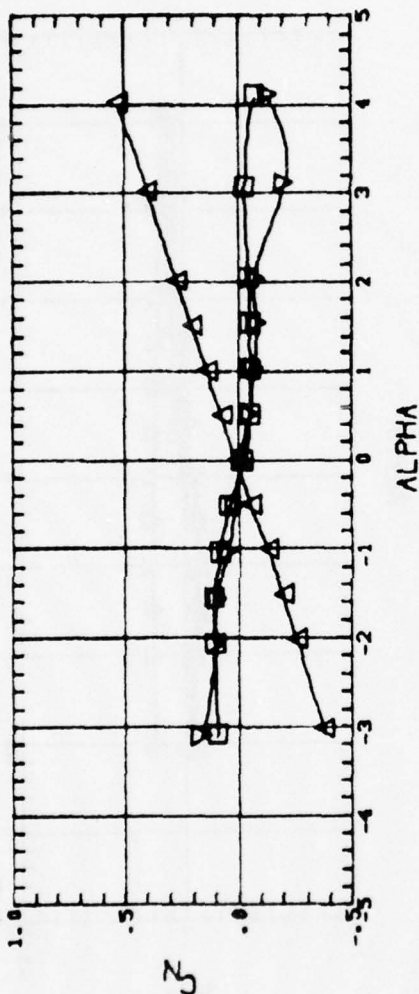
THRUST EFFECTS ON STABILITY COEFFICIENTS BF2

000014
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 LREF 1.100 IN.
 XHRP 5.830 IN.

PARAMETRIC VALUES
 PHI 45.00
 MACH 1.25

AEDC TH050
 CRY
 .01
 5.93
 4.18

SYMBOL
 Δ
 □
 ▽



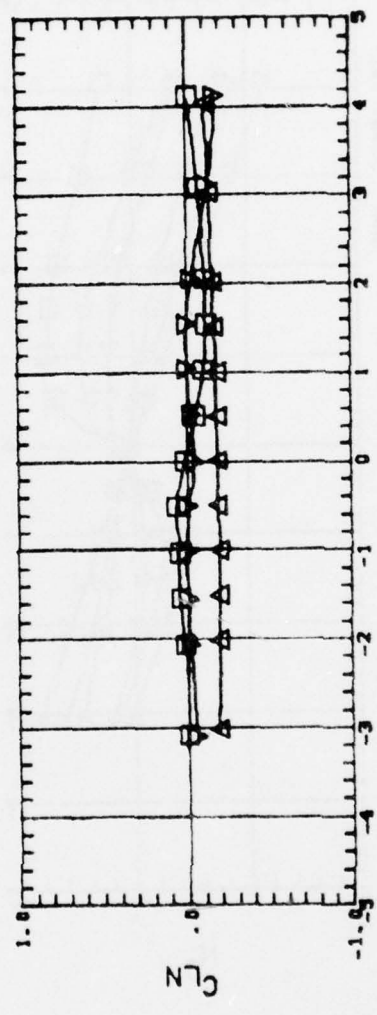
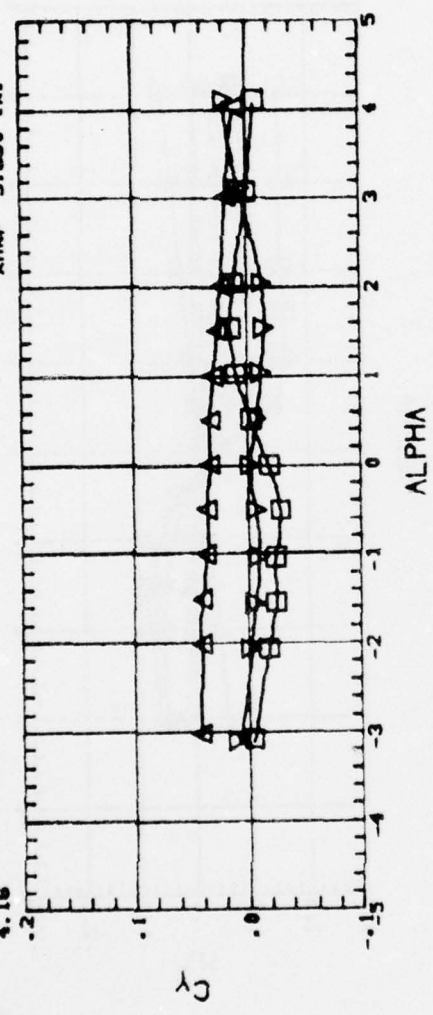
THRUST EFFECTS ON STABILITY COEFFICIENTS BF2, PHI = 45 DEG.

SYMBOL AEDC TK358
 Δ .01
 □ 5.93
 ▽ 4.16

PARAMETRIC VALUES
 PHI 45.00
 MACH 1.25

REFERENCE INFORMATION
 GREF .930 SQ. IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.

BS0014



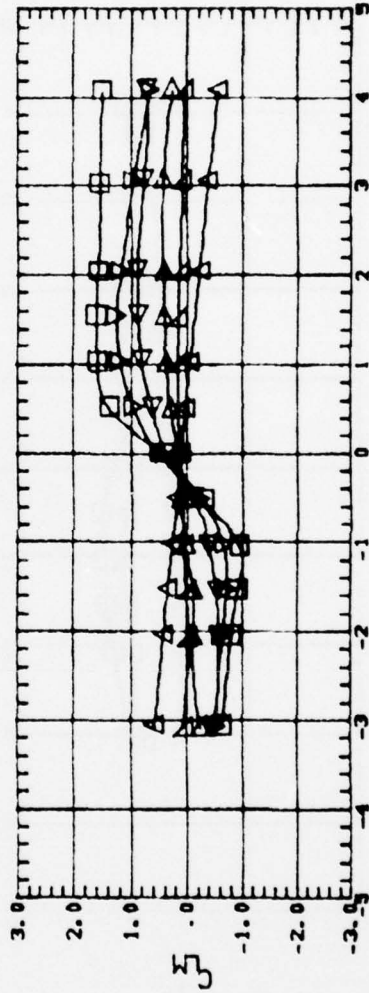
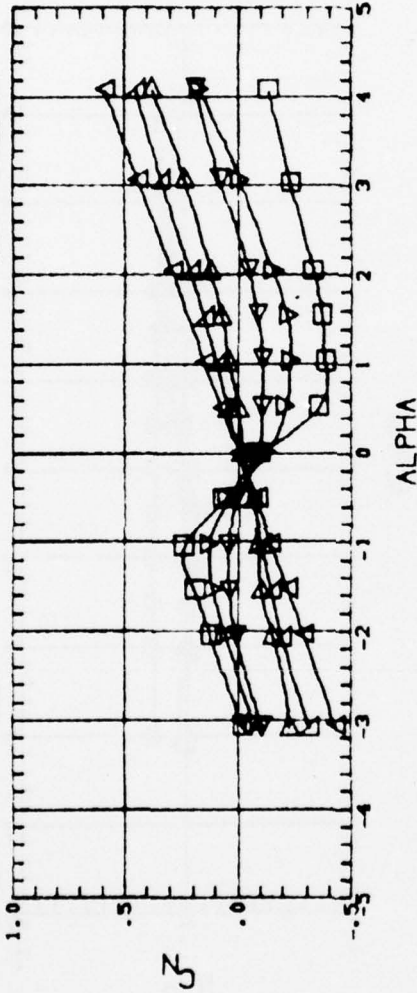
THRUST EFFECTS ON STABILITY COEFFICIENTS BF2, PHI = 45 DEG.
 ALPHA
 PAGE 31

SYMBOL CRT SYMBOL CRT
 Δ .01 Δ 7.16
 □ 8.33 □ 4.13
 ▽ 8.02 ▽ 2.58

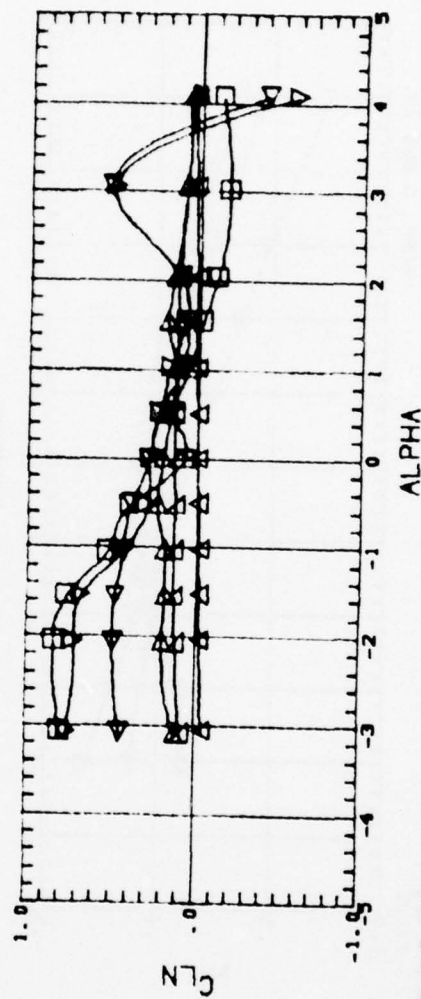
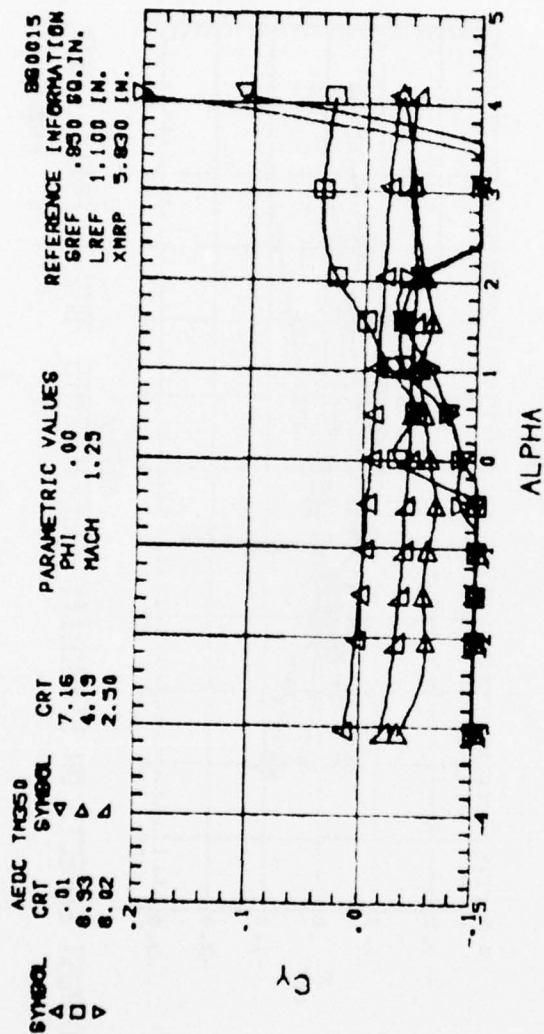
AEDC TM350
 PARAMETRIC VALUES
 PHI .00
 MACH 1.25

REFERENCE INFORMATION
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 LREF 1.100 IN.
 XMRP 5.830 IN.

BS0015



THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 (1.65 FWD)



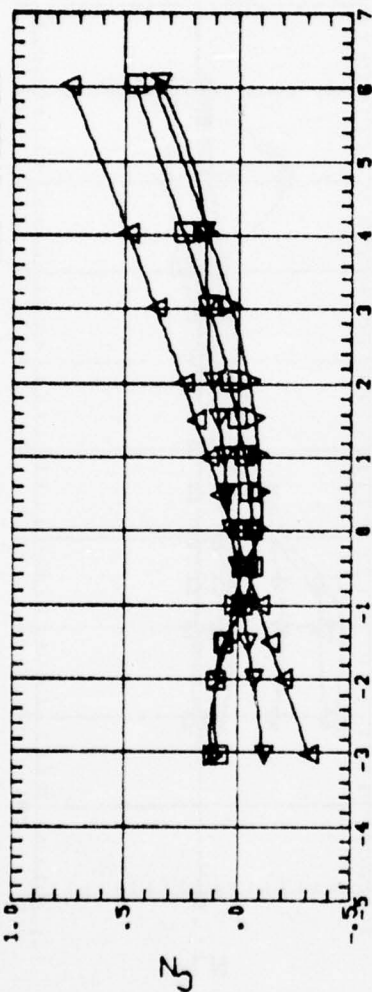
THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 (1.65 FWD)

SYMBOL CRT SYMBOL CRT
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 □ 17.66
 ▽ 11.87

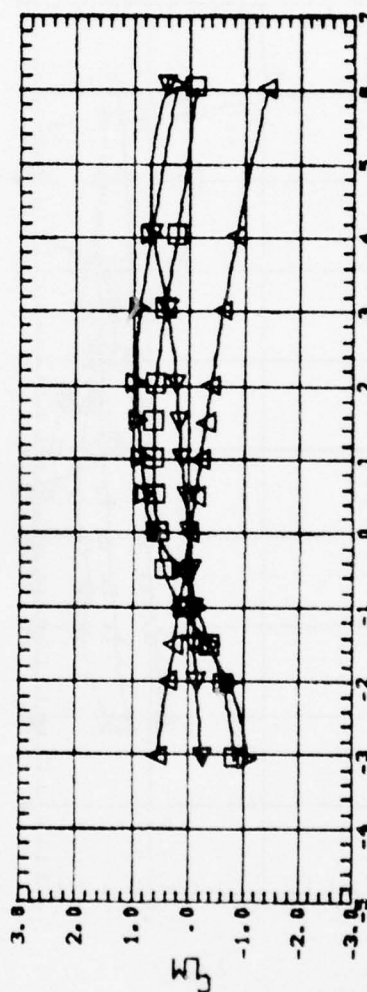
AEDC TH350
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 XMRP 5.838 IN.

PARAMETRIC VALUES
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 MACH .70

880018



ALPHA

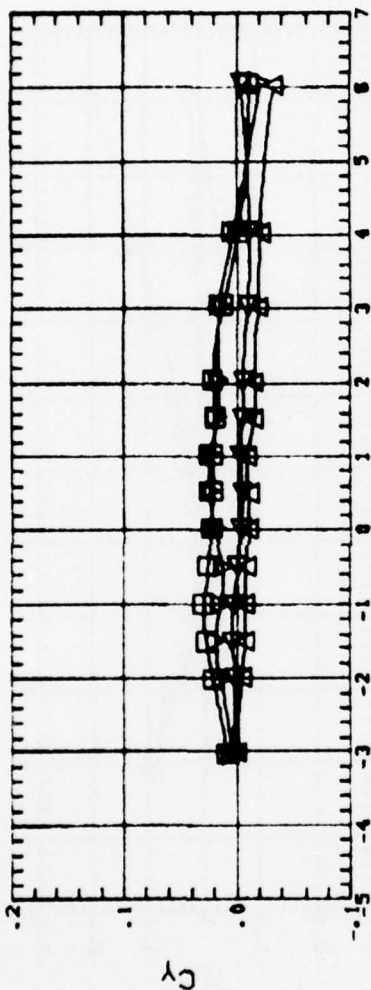


THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 + GRND PL REFL
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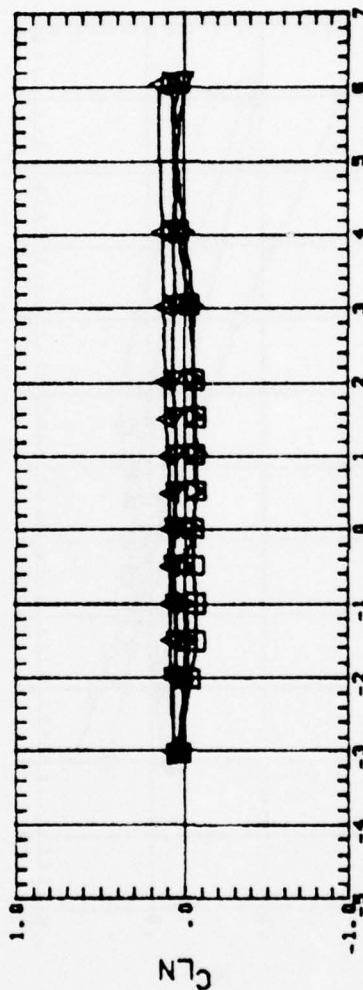
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 Δ .01
 □ 17.08
 ▽ 11.87

PARAMETRIC VALUES
 PHI .00
 MACH .78

REFERENCE INFORMATION
 SREF .838 IN.
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 XMRP 5.838 IN.



ALPHA



ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 + GRND PL REFL

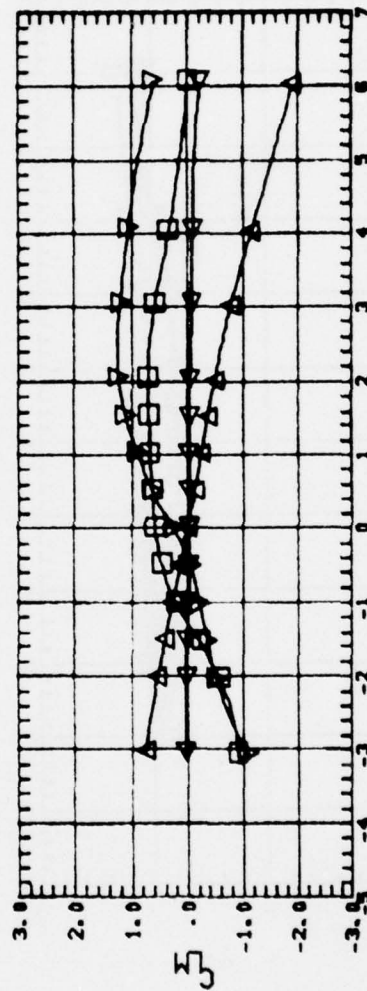
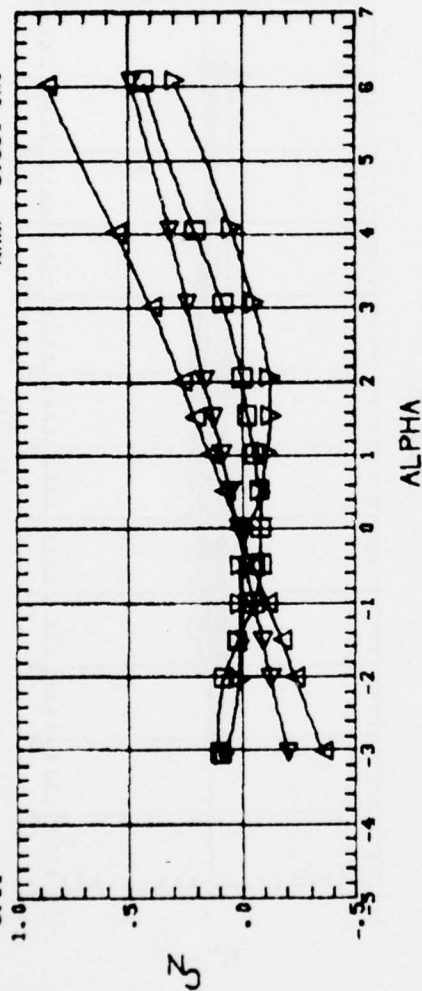
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 □ 12.11 6.04
 ▽ 6.04

AEDC TM350

PARAMETRIC VALUES
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 MACH .90

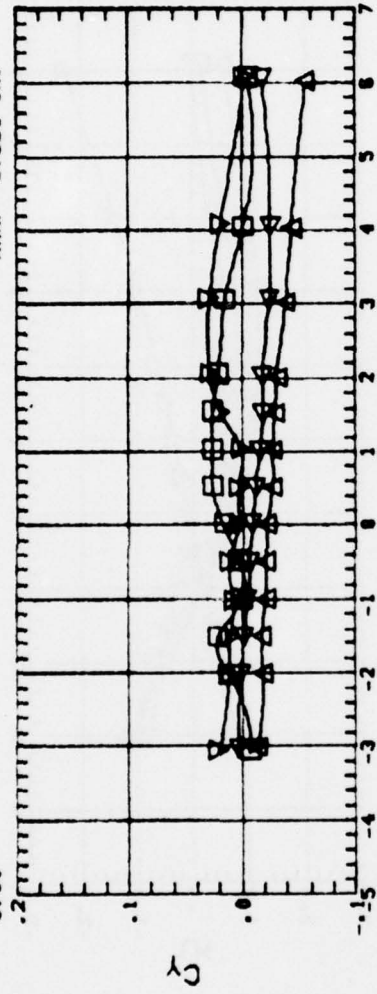
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 XMRP 5.030 IN.

880017

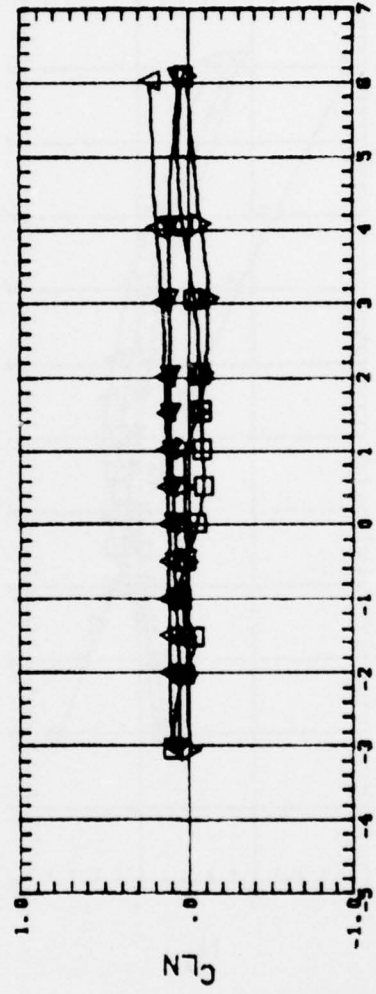


THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 + GRAND PL REFL

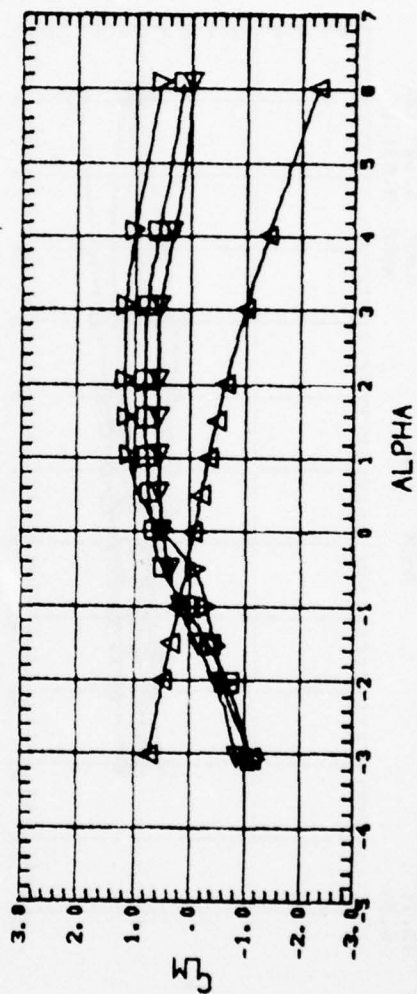
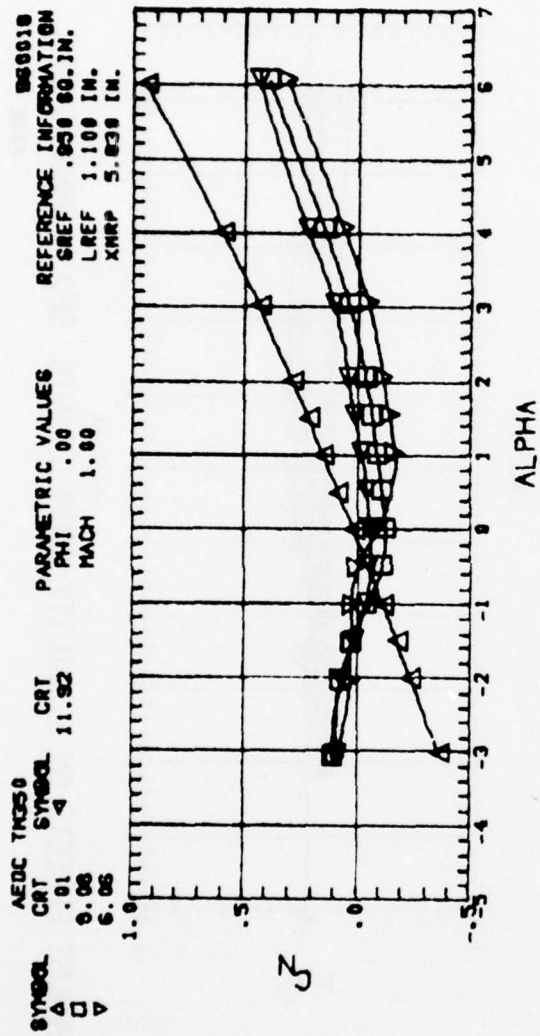
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 LREF 1.100 IN.
 XMRP 5.838 IN.
 PARAMETRIC VALUES
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 MACH .90
 AEDC TH350
 CRT SYMBOL CRT
 .01 4 2.54
 12.11
 6.04
 SYMBOL
 Δ
 □
 ▽



ALPHA

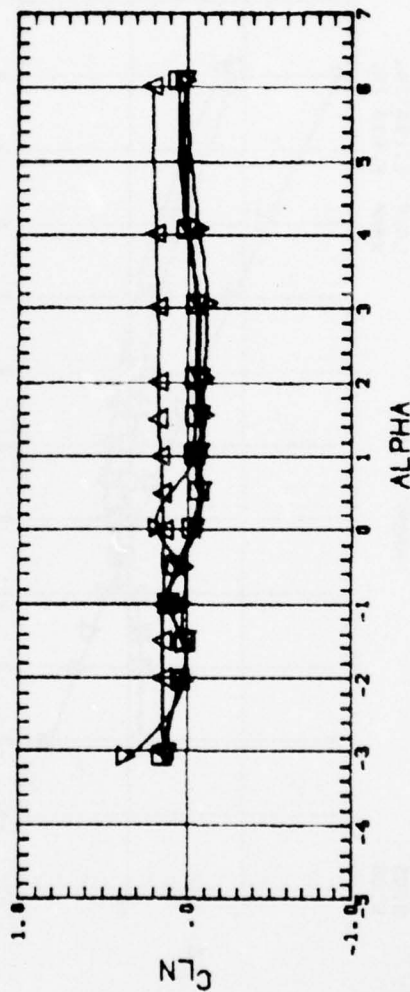
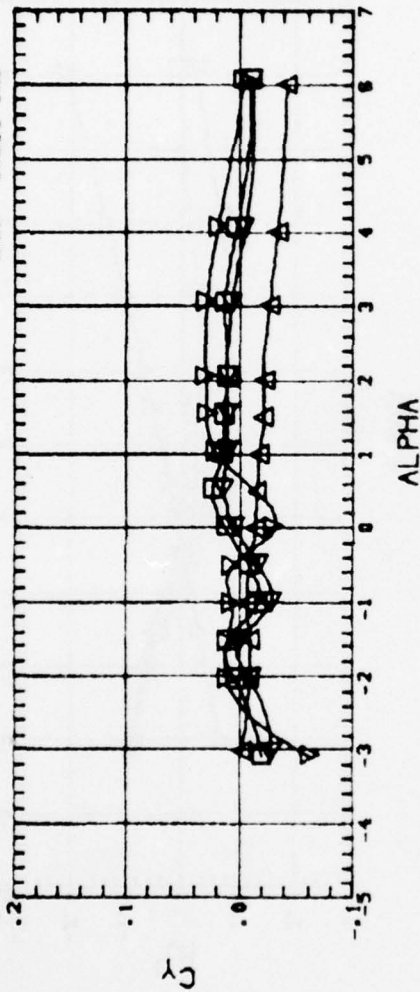


THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 + GRND PL REFL
 ALPHA

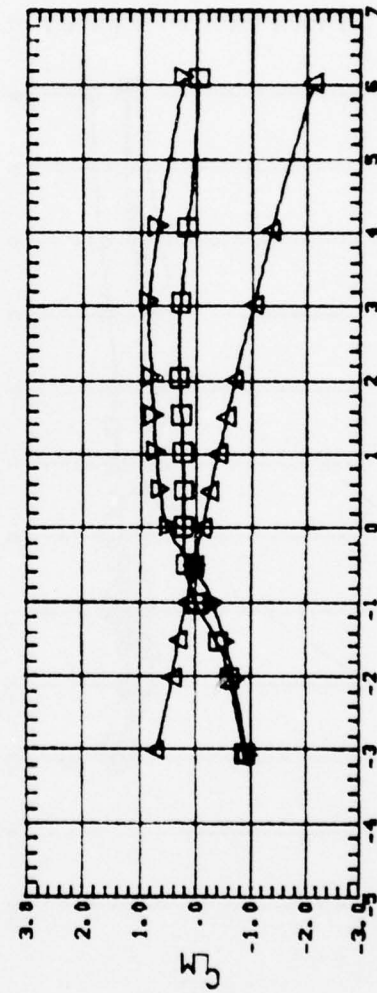
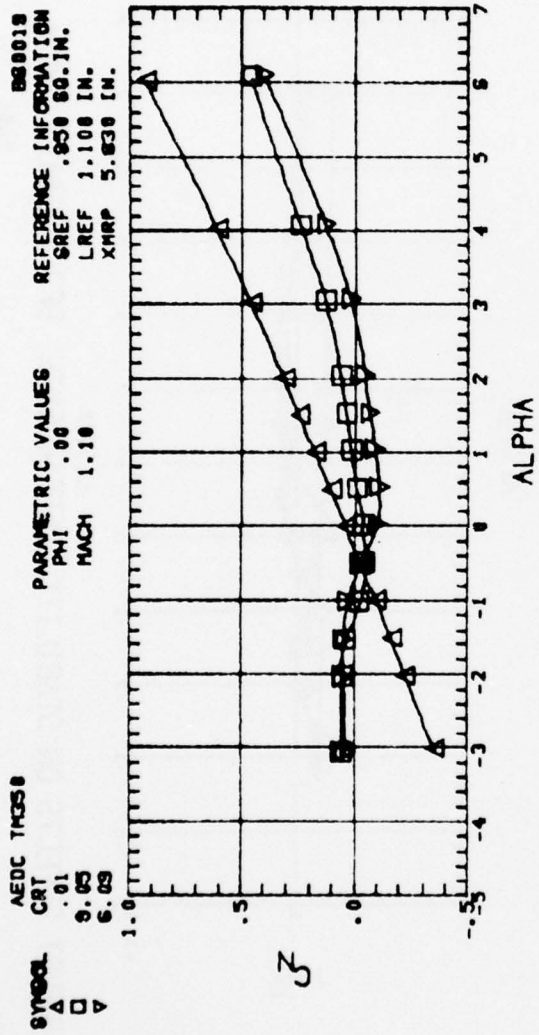


THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 + GRND PL REFL
 ALPHA
 PAGE 38

SYMBOL CRT SYMBOL CRT
 Δ 01 4
 9.08 11.52
 6.06
 AEDC TH030
 REFERENCE INFORMATION
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 LREF 1.100 IN.
 XMRP 5.830 IN.



THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 + GRND PL REFL

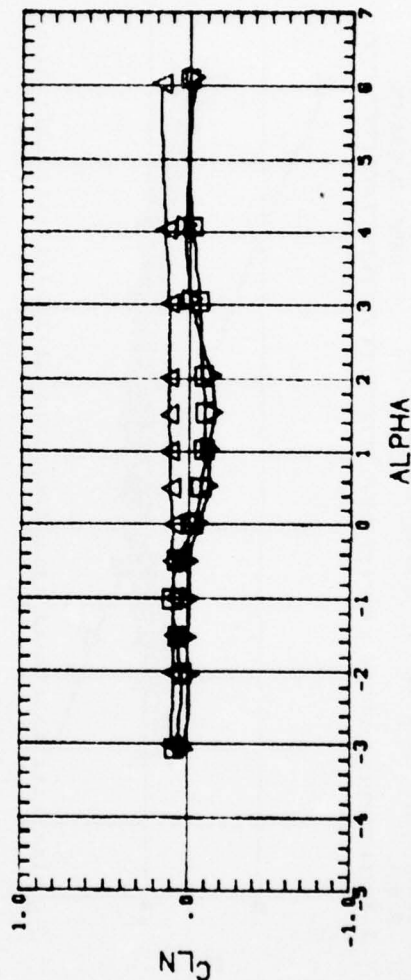
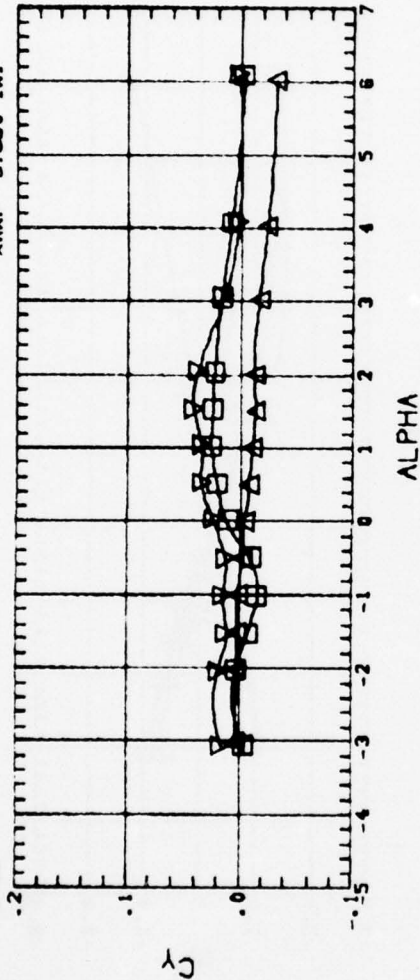


THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 + GRND PL REFL
 ALPHA
 PAGE 40

SYMBOL AEDC TN350
 Δ CRT
 □ .01
 9.05
 6.05

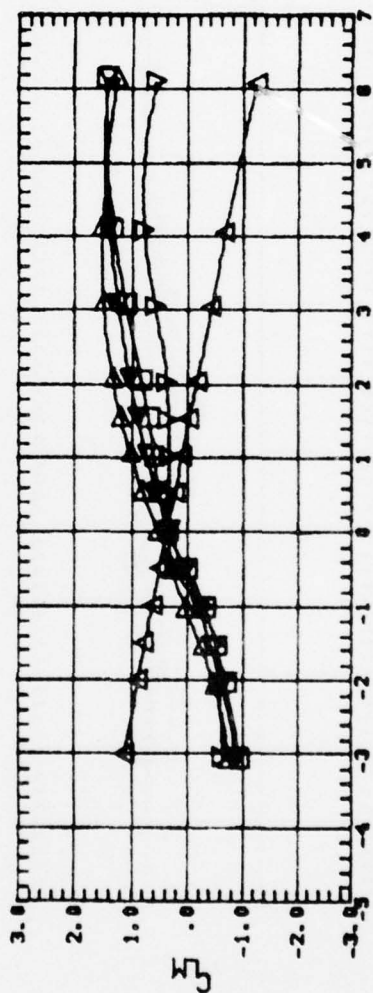
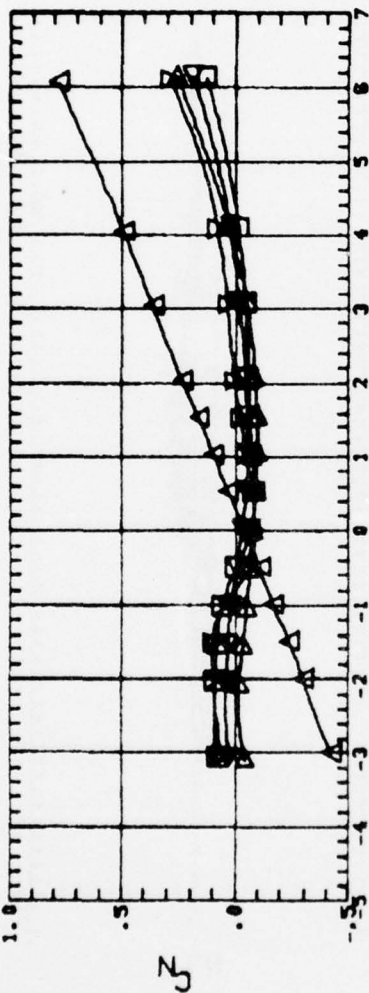
PARAMETRIC VALUES
 PHI .00
 MACH 1.10

860019
 REFERENCE INFORMATION
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 LREF 1.100 IN.
 XMRP 5.830 IN.



THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 + GRND PL REFL

SYMBOL AEDC TNG50 CRT SYMBOL CRT PARAMETRIC VALUES REFERENCE INFORMATION
 Δ .81 4.19 Δ 4.19 PHI .00 SREF .856 IN.
 □ 7.17 2.58 □ 2.58 MACH 1.25 LREF 1.108 IN.
 ▽ 8.91 ▽ XMRP 5.822 IN.

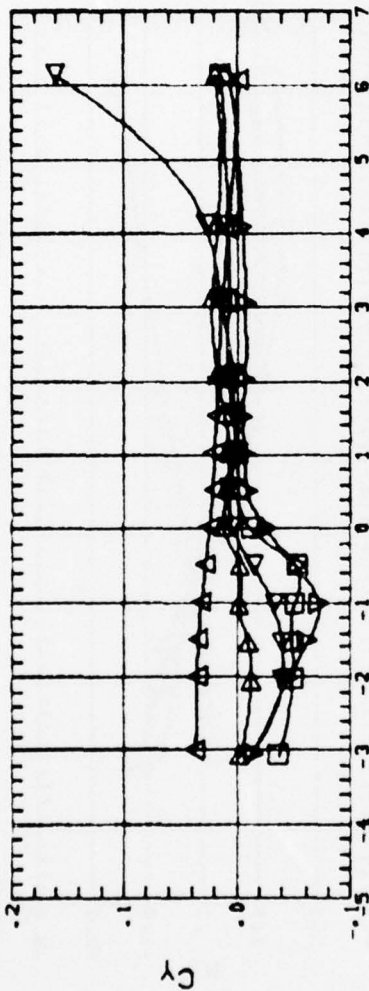


THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 + GRND PL REFL

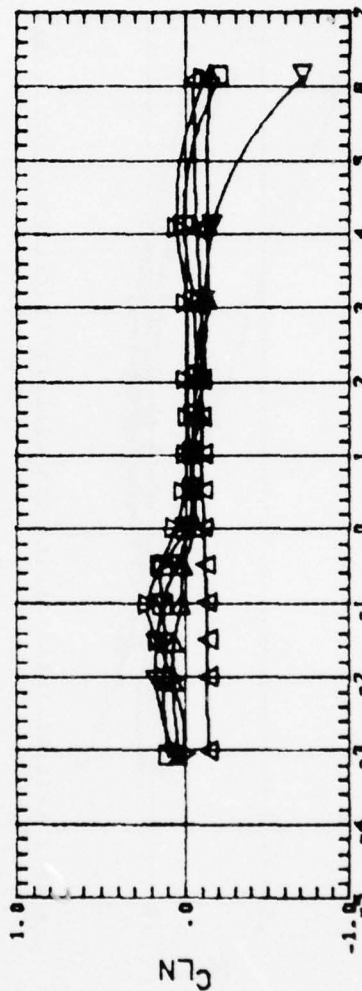
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 □ 7.17 Δ 2.50
 8.91

880020
 REFERENCE INFORMATION
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 LREF 1.100 IN.
 XMRP 5.830 IN.

PARAMETRIC VALUES
 PHI .80
 MACH 1.25



ALPHA



ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 + GRND PL REFL

AD-A040 860

REMTECH INC HUNTSVILLE ALA

F/G 20/4

AN INVESTIGATION OF FLOW AND STABILITY CHARACTERISTICS FOR A B0--ETC(U)

MAY 77 C W DAHLKE

DAAK40-77-C-0008

UNCLASSIFIED

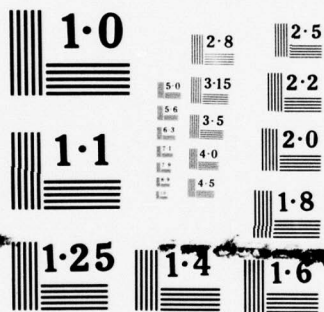
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NL

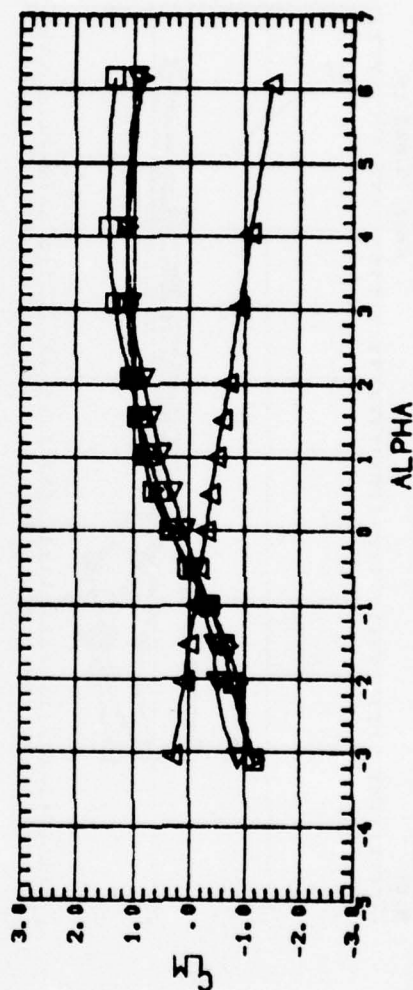
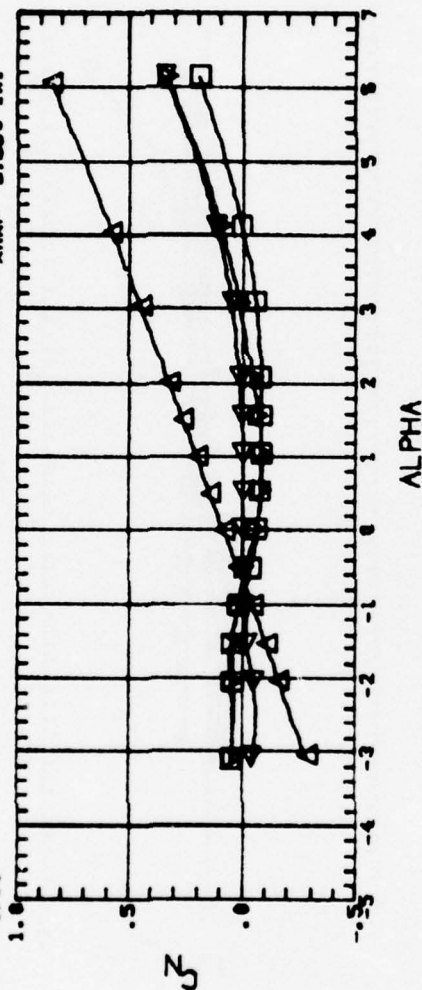
2 OF 2
ADA
040860





NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

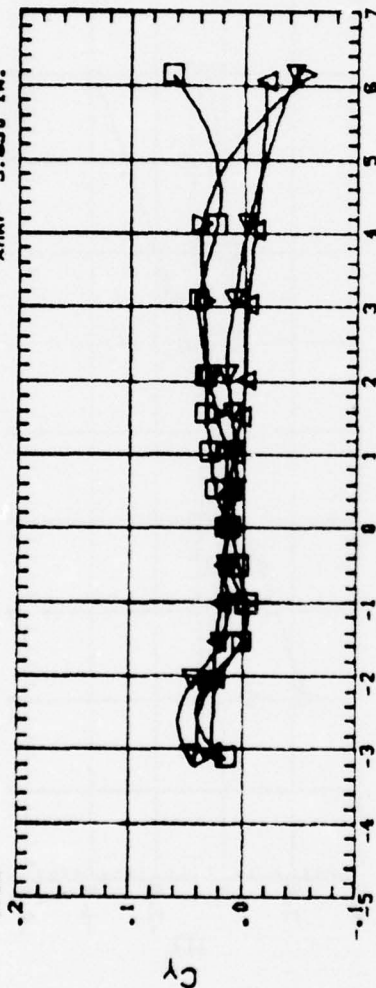
REFERENCE INFORMATION
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LREF 1.100 IN.
XMRP 5.830 IN.

THRUST EFFECTS ON STABILITY COEFFICIENTS B_{F2} + GRND PL REFL

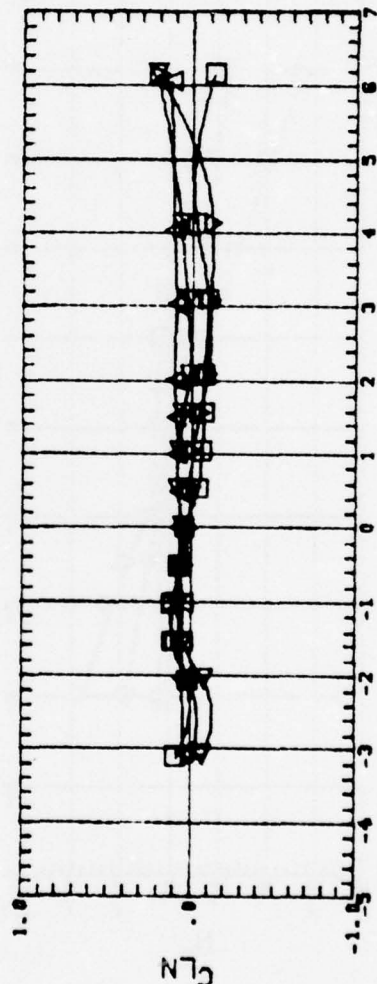
BS0021
 REFERENCE INFORMATION
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 LREF 1.100 IN.
 XMRP 5.830 IN.

PARAMETRIC VALUES
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 MACH 1.40

AEDC TH350
 CRT SYMBOL
 .01 Δ
 5.04
 4.10



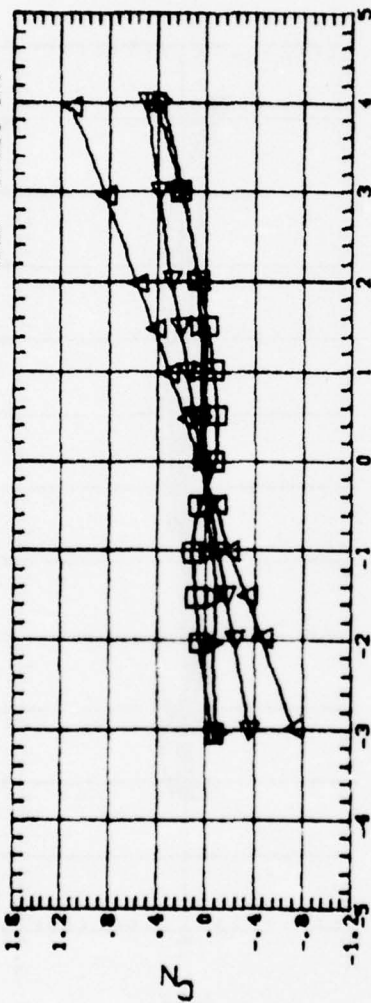
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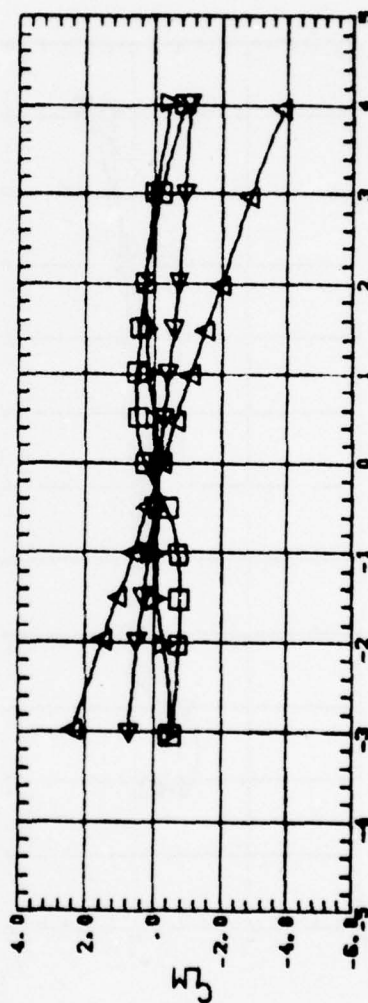
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THRUST EFFECTS ON STABILITY COEFFICIENTS BF2 + GRND PL REFL

SYMBOL AEDC TH350 CRT PARAMETRIC VALUES REFERENCE INFORMATION
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 □ 17.57 MACH .70 LREF 1.108 IN.
 ▽ 9.05 XMRP 5.836 IN.

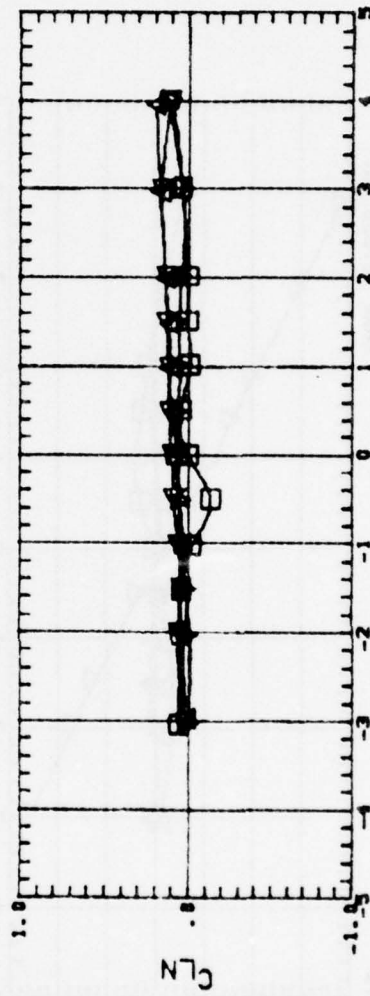
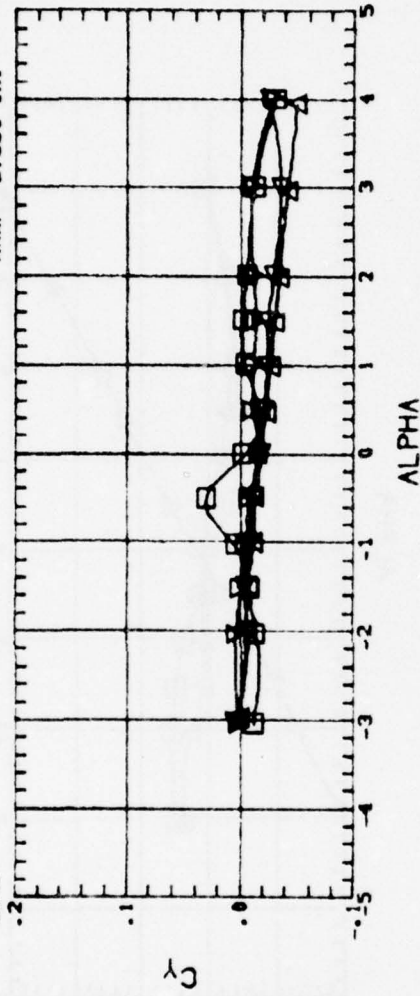


ALPHA



THRUST EFFECTS ON STABILITY COEFFICIENTS BF5
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SYMBOL Δ \square
 AEDC TMS00 CRT SYMBOL Δ
 CRT 17.97 9.05
 REF 1.100 IN.
 XMRP 5.838 IN.
 REFERENCE INFORMATION
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 LREF 1.100 IN.
 XMRP 5.838 IN.
 PARAMETRIC VALUES
 PHI .00
 MACH .70
 CRT 6.03
 BS0022



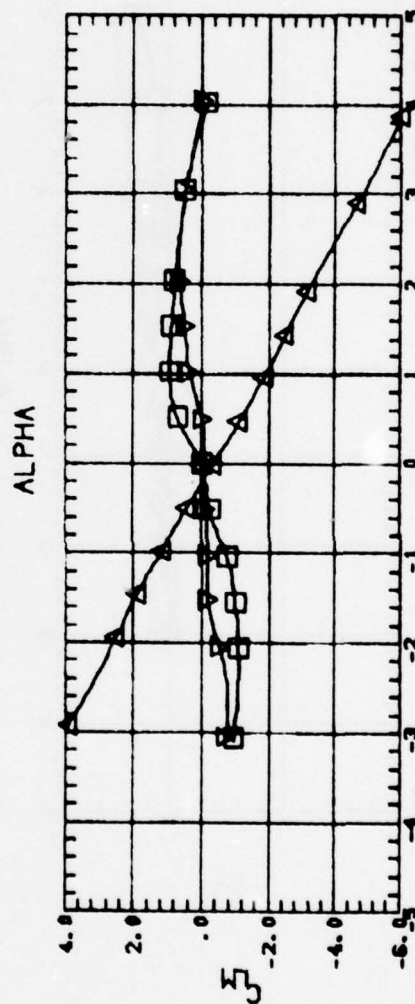
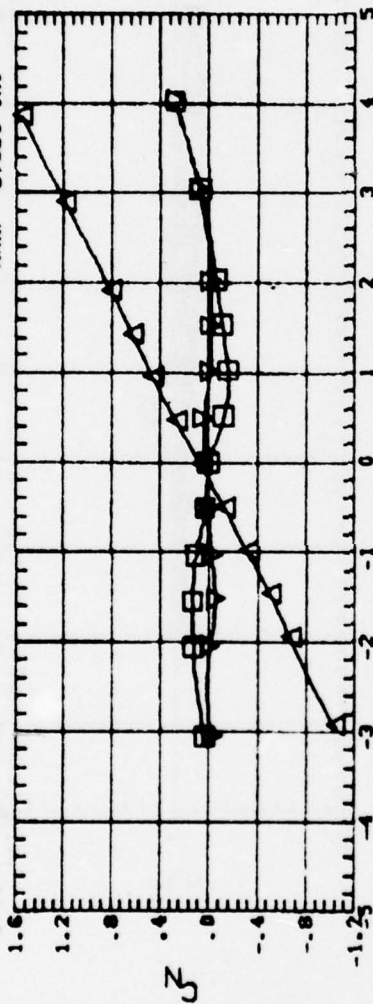
THRUST EFFECTS ON STABILITY COEFFICIENTS BF5

SYMBOL CRT AEDC TMS50
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 □ 9.18
 ▼ 8.10

PARAMETRIC VALUES
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 MACH .90

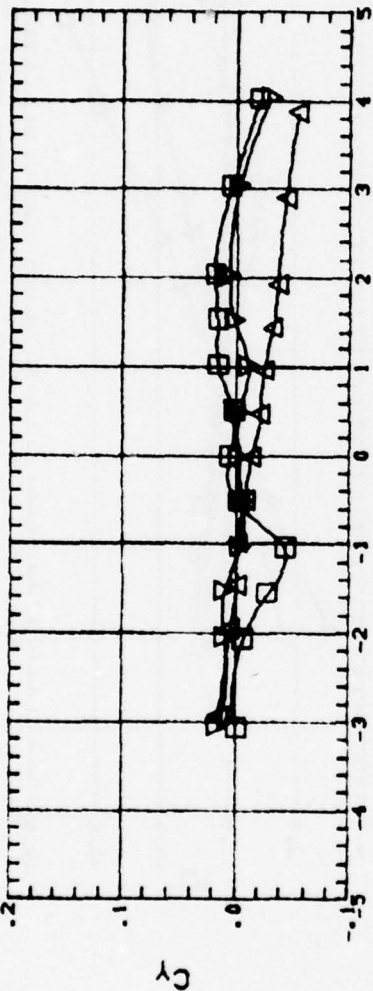
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860823

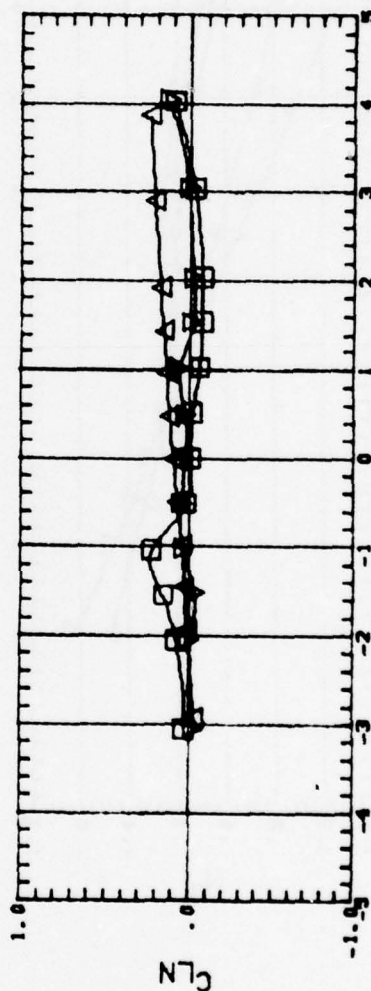


THRUST EFFECTS ON STABILITY COEFFICIENTS BF5
 ALPHA

088023
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 XMRP 5.836 IN.
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 MACH .90
 AEDC TH050
 CRT
 .01
 9.16
 6.10
 SYMBOL
 ▲
 □
 △



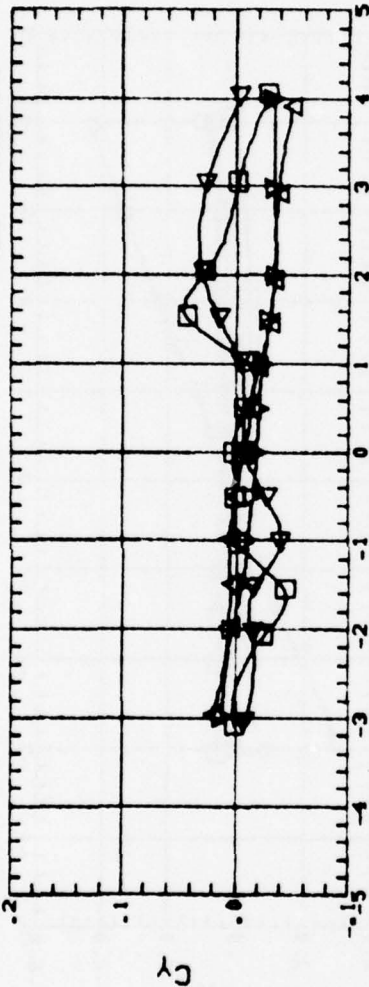
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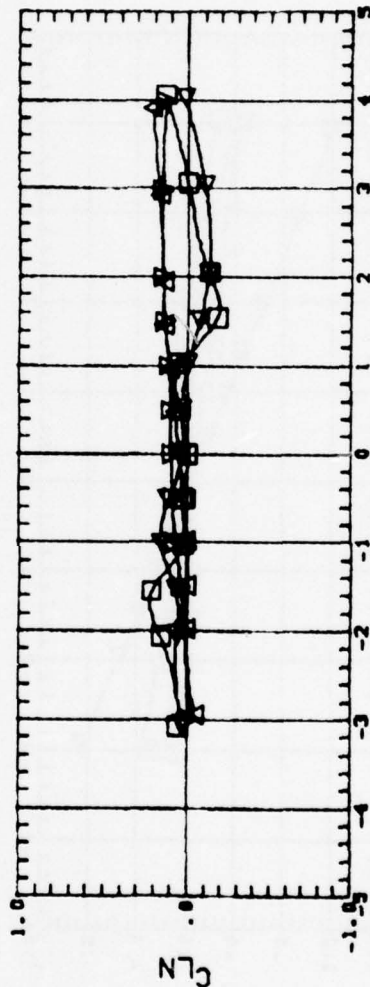
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THRUST EFFECTS ON STABILITY COEFFICIENTS BF5

SYMBOL AEDC TMS50 CRT SYMBOL CRT PARAMETRIC VALUES REFERENCE INFORMATION
 Δ .01 12.23 Δ .01 PHI .00 SREF .858 SO. IN.
 □ 0.15 MACH 1.00 LREF 1.100 IN.
 ▽ 2.57 XMRP 5.830 IN.



ALPHA

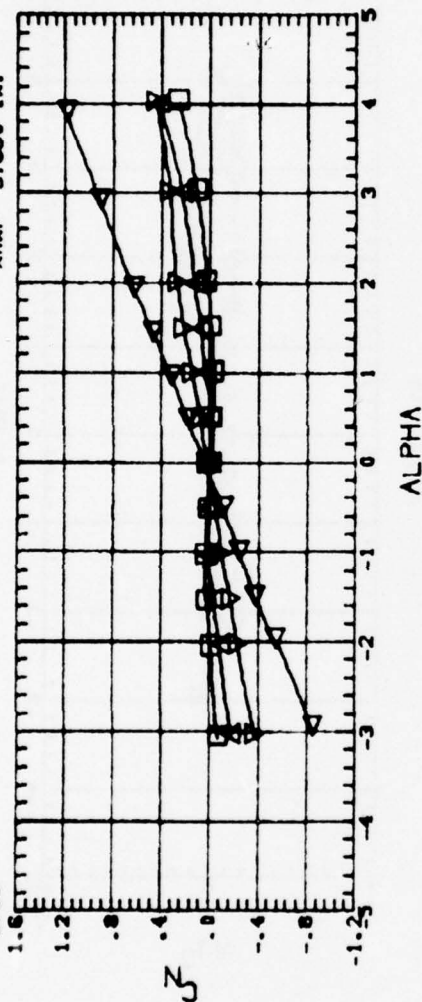


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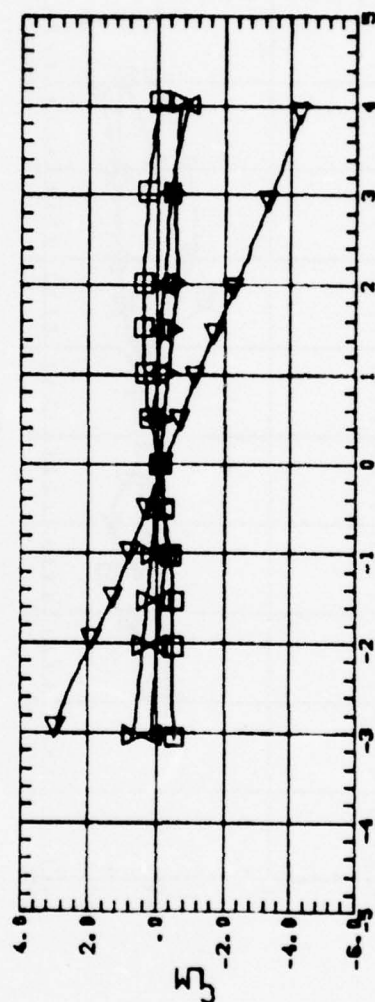
THRUST EFFECTS ON STABILITY COEFFICIENTS BF5

SYMBOL AEDC THRSO CRT SYMBO CRT PARAMETRIC VALUES REFERENCE INFORMATION
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 □ 8.14 MACH 1.10 LREF 1.100 IN.
 ▽ 2.36 XMRP 5.830 IN.

BS825



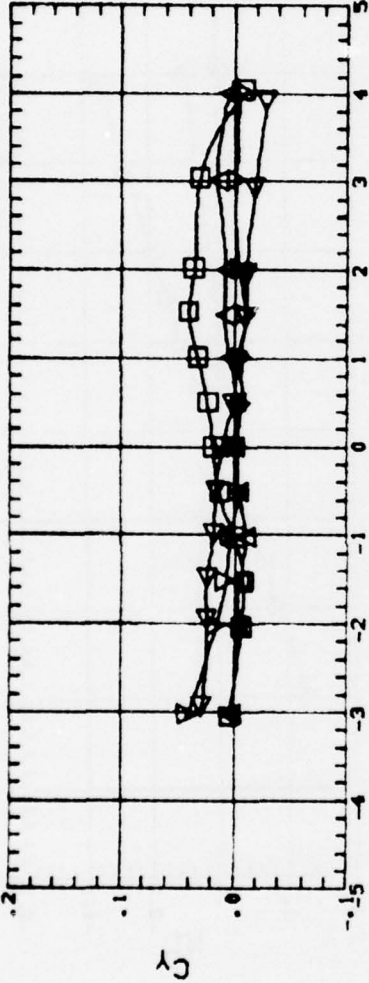
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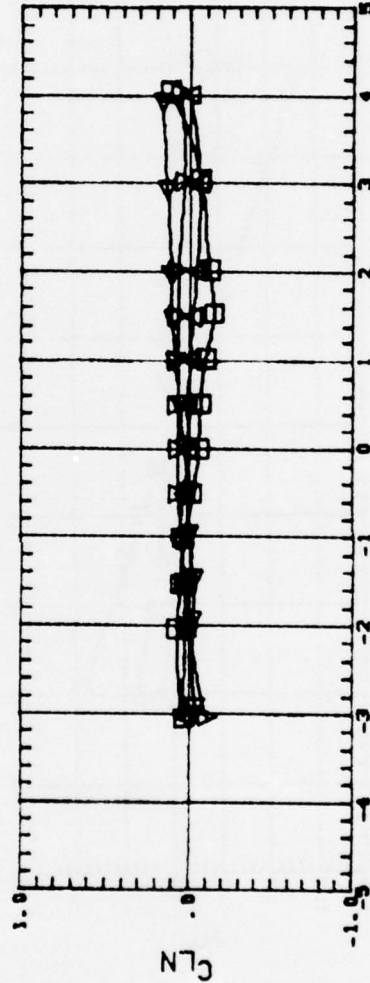
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THRUST EFFECTS ON STABILITY COEFFICIENTS BF5

SYMBOL CRT AEDC TH350 CRT PARAMETRIC VALUES REFERENCE INFORMATION
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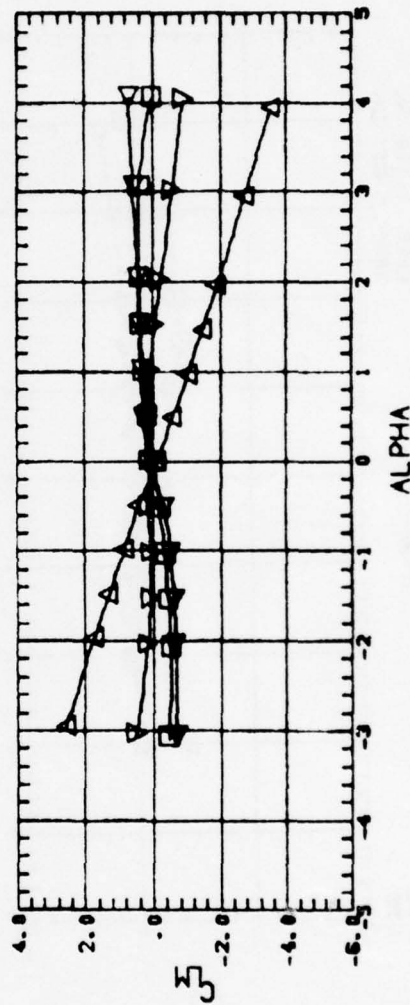
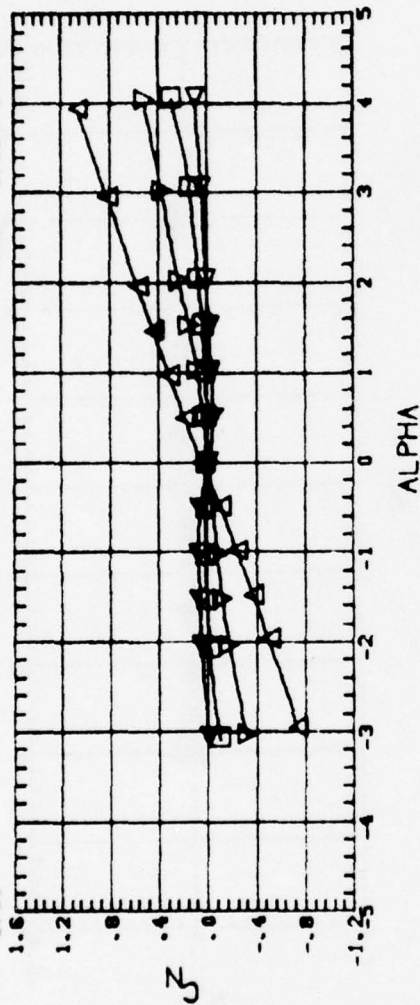
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ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BF5

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 CRT SYMBO PHI MACH 1.25 GREF .950 IN.
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THRUST EFFECTS ON STABILITY COEFFICIENTS BF5

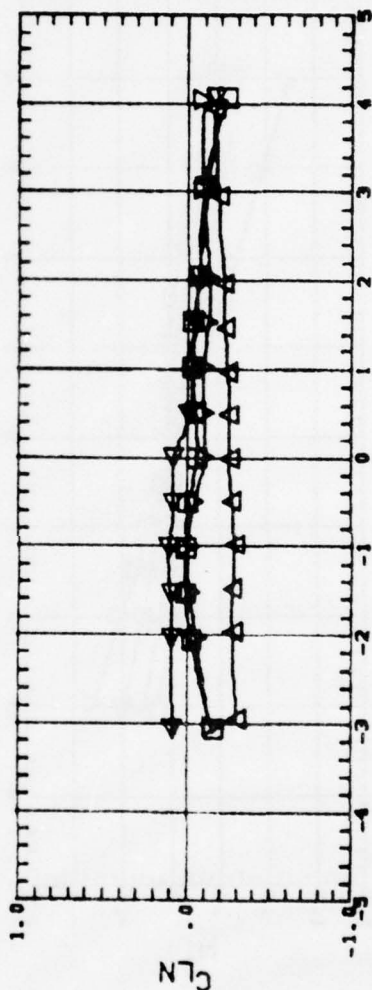
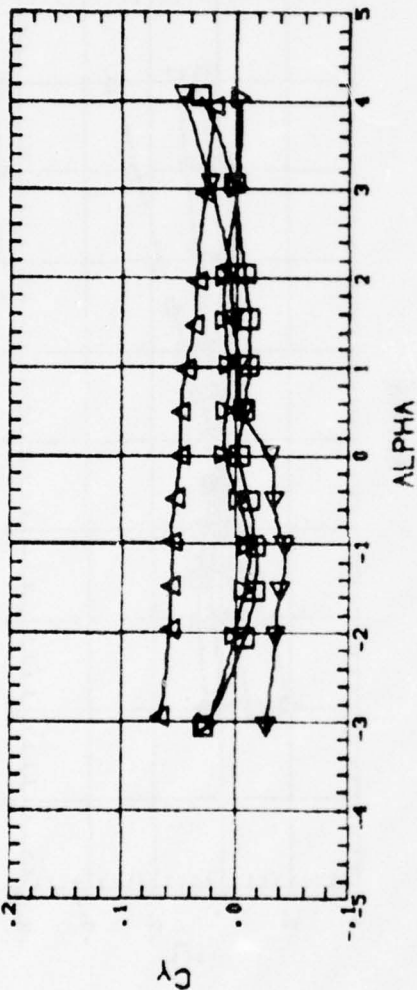
SYMBOL CRT SYMBOL CRT
 A .01 4
 B 4.21
 C 2.51

AEDC TK350
 CRT SYMBOL CRT
 .01 4
 4.21
 2.51

PARAMETRIC VALUES
 PHI .00
 MACH 1.25

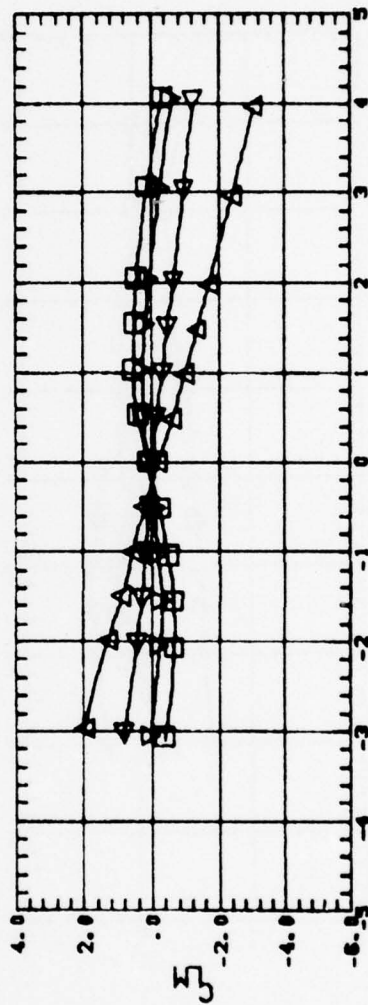
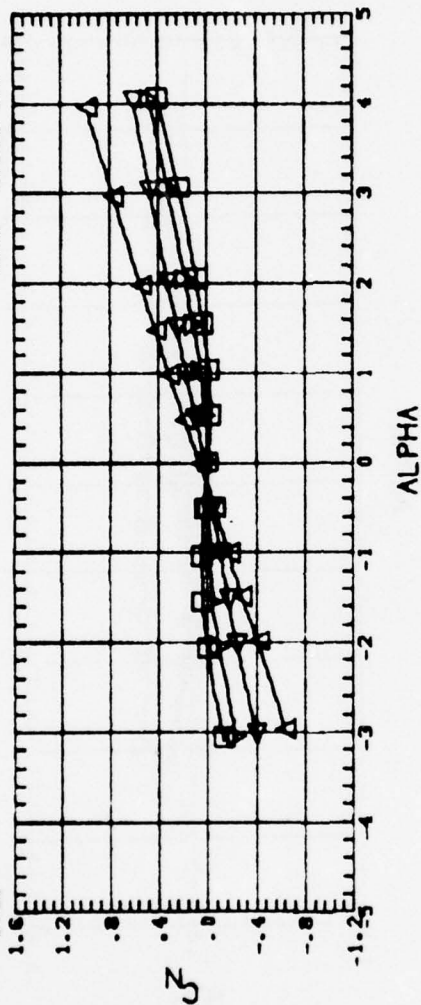
REFERENCE INFORMATION
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 XMRP 5.000 IN.

880028



THRUST EFFECTS ON STABILITY COEFFICIENTS BF5

SYMBOL AEDC TH350 CRT SYMBO CRT PARAMETRIC VALUES REFERENCE INFORMATION
 △ .01 4 .00 PHI GREF .850 80 IN.
 □ 4.09 2.41 MACH LREF 1.100 IN.
 ▽ 2.92 XMRP 5.830 IN.



THRUST EFFECTS ON STABILITY COEFFICIENTS BF5

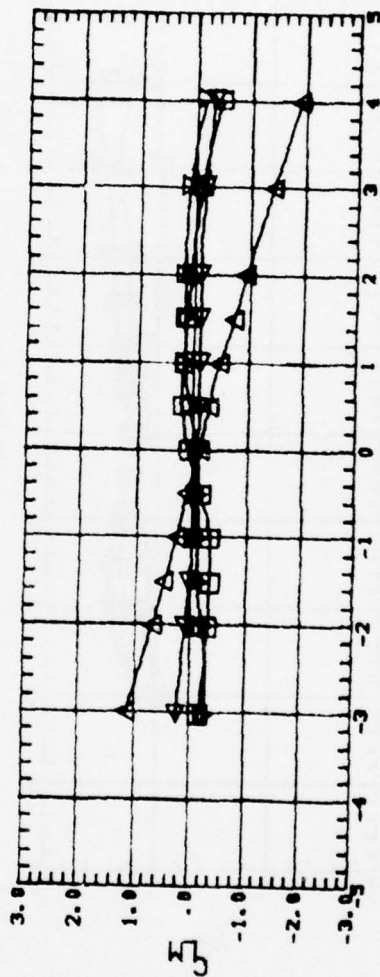
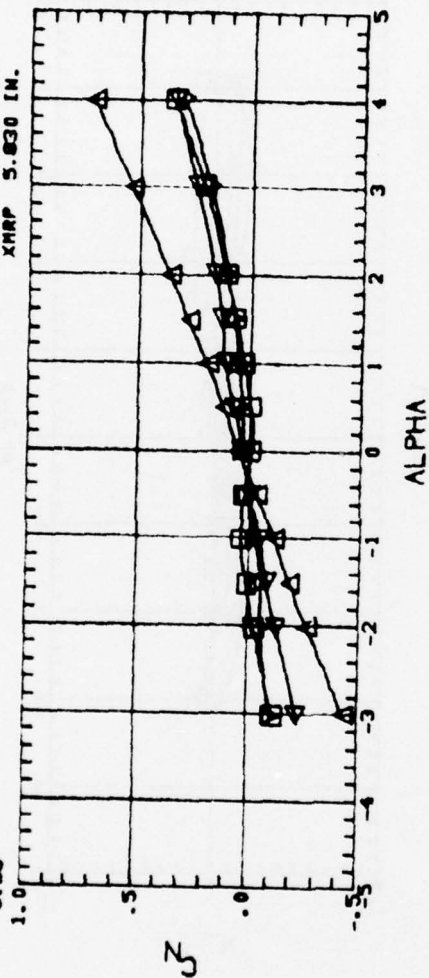
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 Δ 17.28 6.00
 □ 8.93 6.00
 ▽ 8.93 6.00

AEDC THUS
 CRT SYMBOL
 Δ 17.28 6.00
 □ 8.93 6.00
 ▽ 8.93 6.00

PARAMETRIC VALUES
 PHI .00
 MACH .70

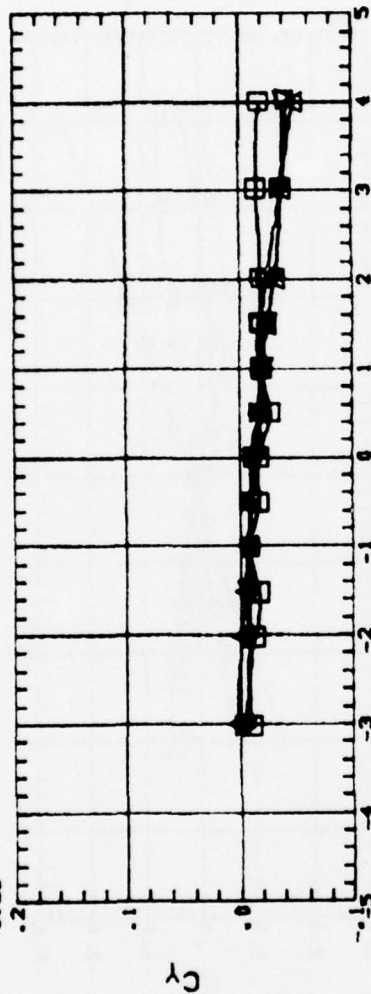
REFERENCE INFORMATION
 SREF .850 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.

BE8028

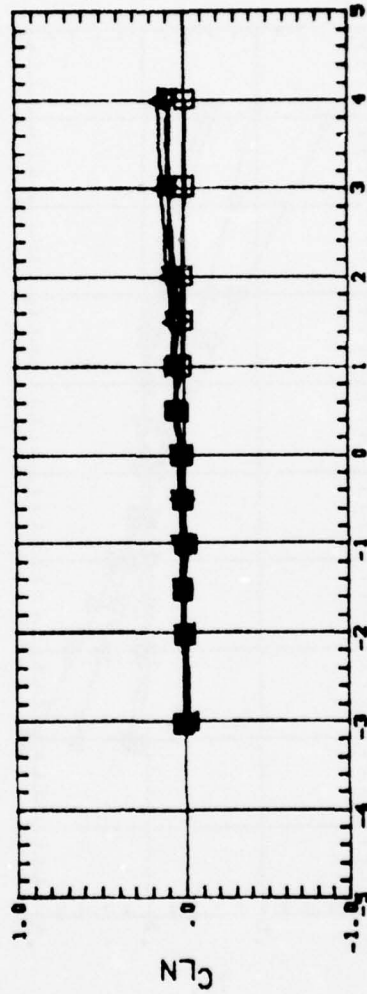


THRUST EFFECTS ON STABILITY COEFFICIENTS BF6
 ALPHA

SYMBOL CRT AEDC TH350 CRT PARAMETRIC VALUES REFERENCE INFORMATION
 ▲ .01 PHI .00 SREF .950 IN.
 □ 17.26 MACH .70 LREF 1.100 IN.
 ▲ 8.53 XMRP 5.830 IN.



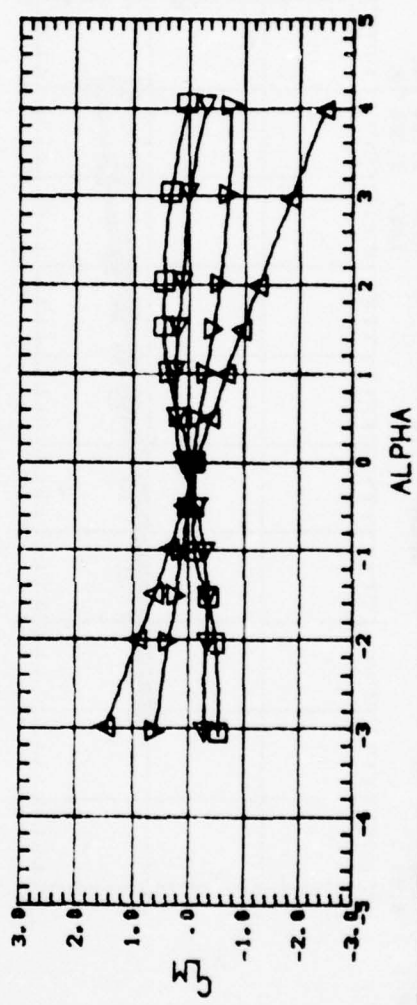
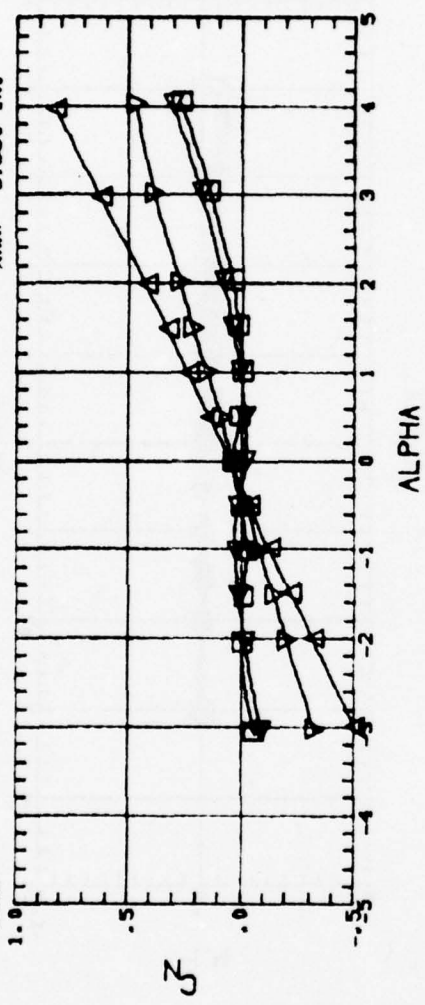
ALPHA



ALPHA

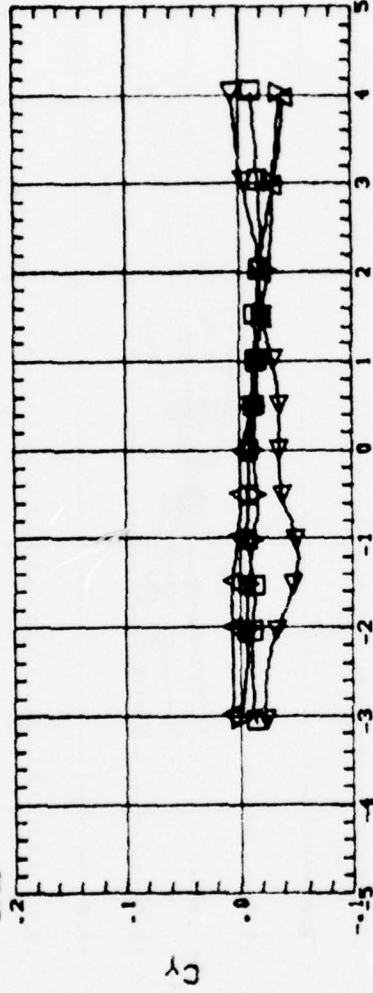
THRUST EFFECTS ON STABILITY COEFFICIENTS BF6

BS0029
 REFERENCE INFORMATION
 SREF .850 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.
 PARAMETRIC VALUES
 PHI .00
 MACH 1.00
 AEOC TH350
 CRT SYMBOL CRT
 .01 12.11
 6.08
 2.32
 SYMBOL
 Δ
 □
 ▽

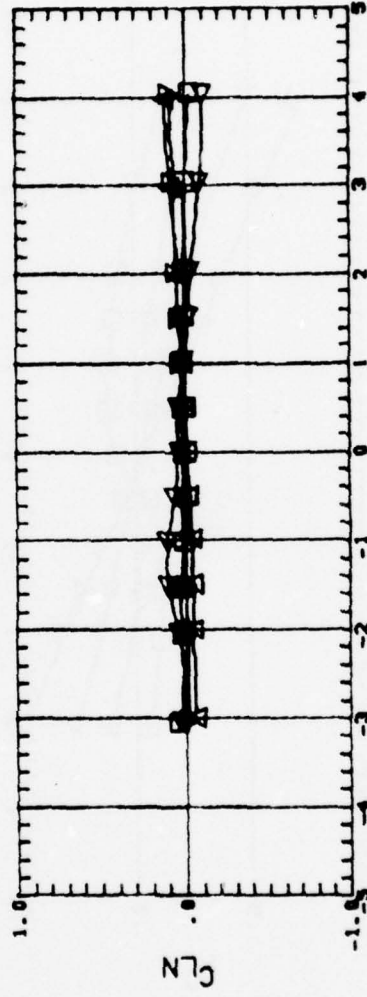


THRUST EFFECTS ON STABILITY COEFFICIENTS BS0029

958829
 REFERENCE INFORMATION
 GREF .850 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.
 PARAMETRIC VALUES
 PHI .00
 MACH 1.00
 AEDC THRO50
 CRT SYMBOL CRT
 .01 4 12.11
 6.06
 2.52

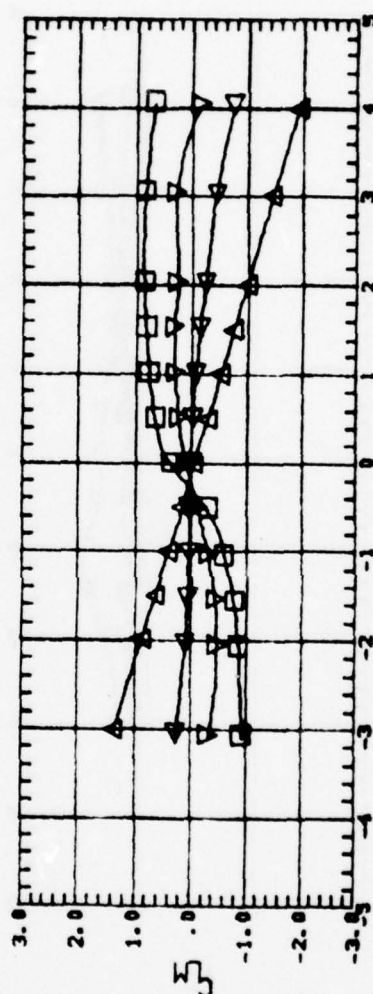
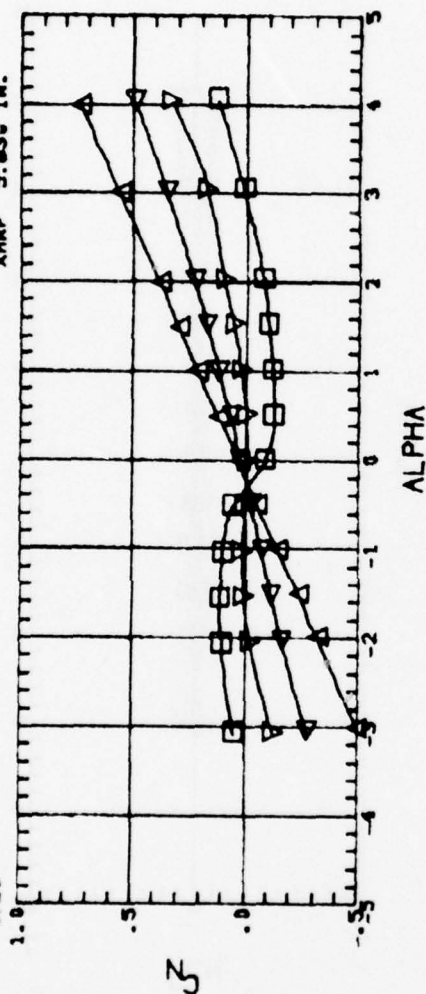


ALPHA



THRUST EFFECTS ON STABILITY COEFFICIENTS BFG
 ALPHA

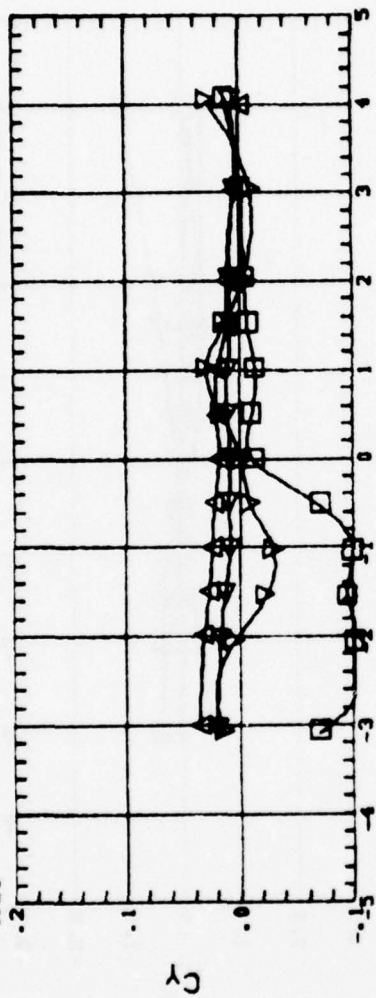
060030
REFERENCE INFORMATION
SREF .950 80. IN.
LREF 1.100 IN.
XMRP 5.830 IN.



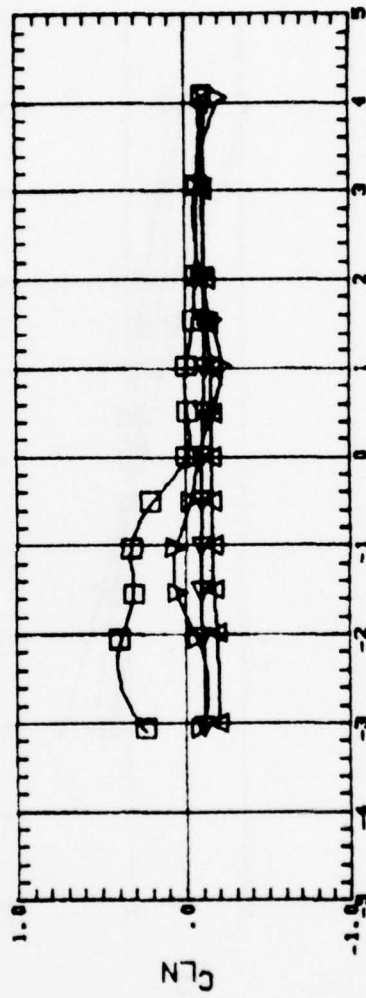
ALPHA
THRUST EFFECTS ON STABILITY COEFFICIENTS BFG

DS8030

AEDC THCSB		PARAMETRIC VALUES		REFERENCE INFORMATION	
SYMBOL	CRT	PHI	MACH	SREF	LREF
△	7.21	.00	1.25	.850 IN.	1.100 IN.
□	4.20			XMRP	5.830 IN.



ALPHA



THRUST EFFECTS ON STABILITY COEFFICIENTS BF6

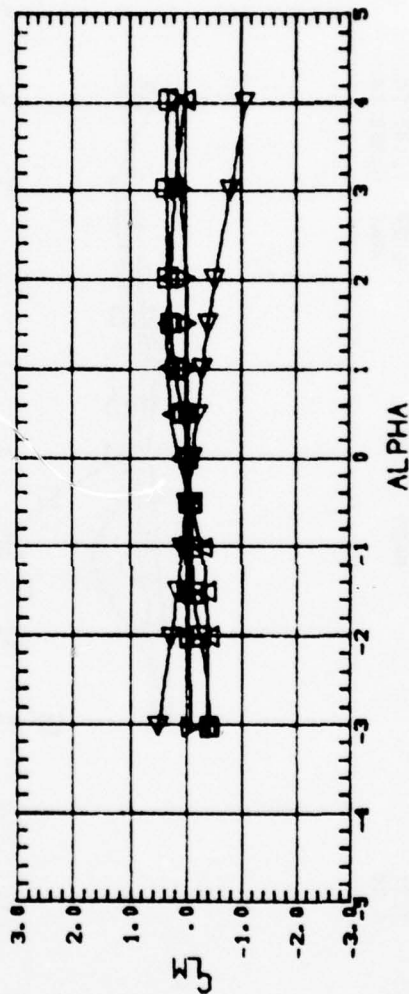
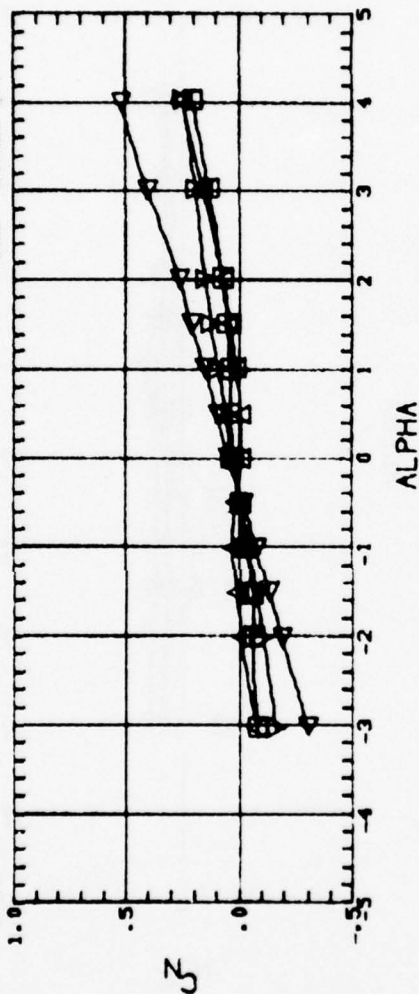
SYMBOL CRT SYMBOL CRT
 17.97 6.01
 9.02
 6.01

AEDC TH350
 CRT SYMBOL
 17.97 6.01
 9.02
 6.01

PARAMETRIC VALUES
 PHI .00
 MACH .70

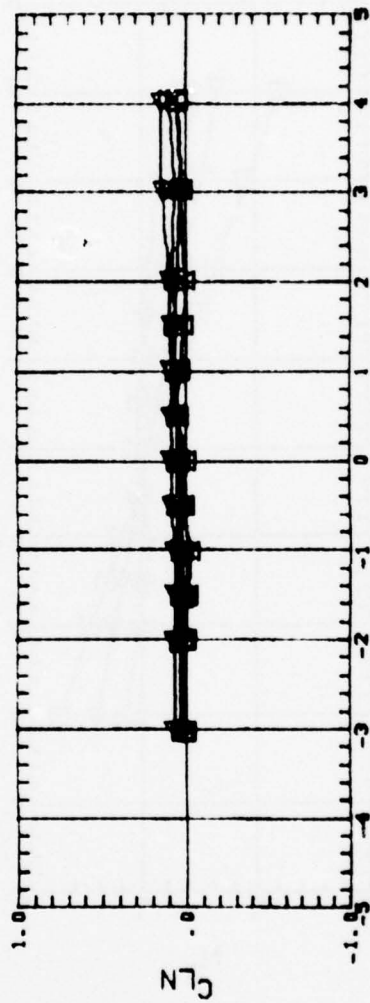
REFERENCE INFORMATION
 SREF .958 80. IN.
 LREF 1.108 IN.
 XMRP 5.838 IN.

880031



THRUST EFFECTS ON STABILITY COEFFICIENTS BF7

Graph of C_γ vs α for the 1000 cm^{-1} band. The y-axis is labeled C_γ and ranges from -2 to 2. The x-axis is labeled α and ranges from -5 to 5. Data points are plotted for various temperatures and are nearly all clustered around $C_\gamma = 0$.

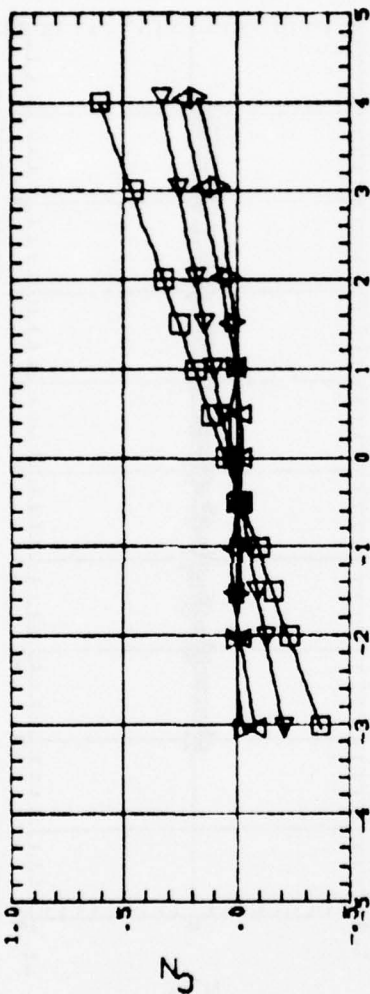


ALPHA
THRUST EFFECTS ON STABILITY COEFFICIENTS BF7

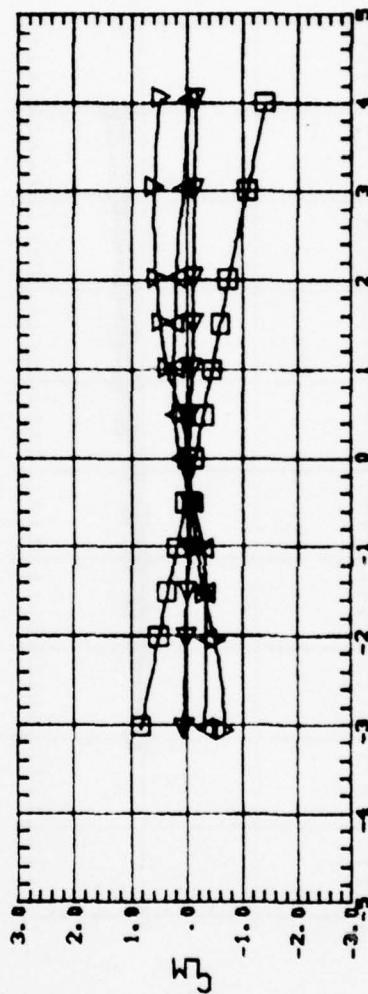
SYMBOL AEDC TH350 CRT SYMBO CRT 2.54
 Δ 12.16 4
 □ .01
 ▽ 6.08

PARAMETRIC VALUES
 PHI .00
 MACH 1.00

REFERENCE INFORMATION
 SREF .850 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.

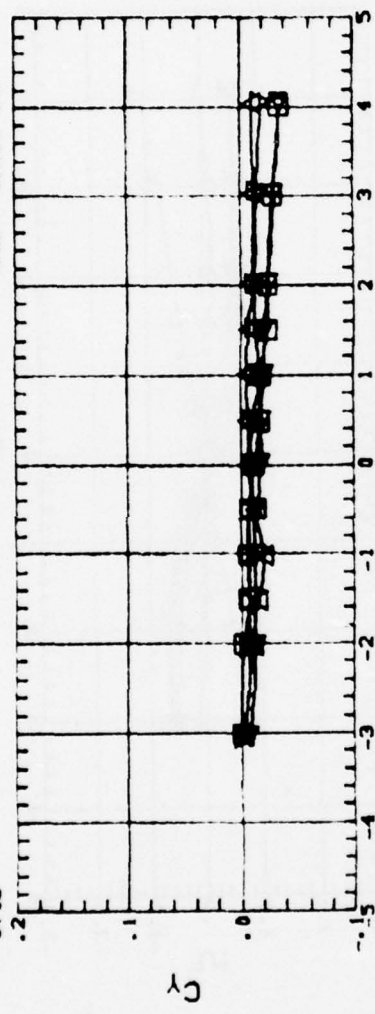


ALPHA

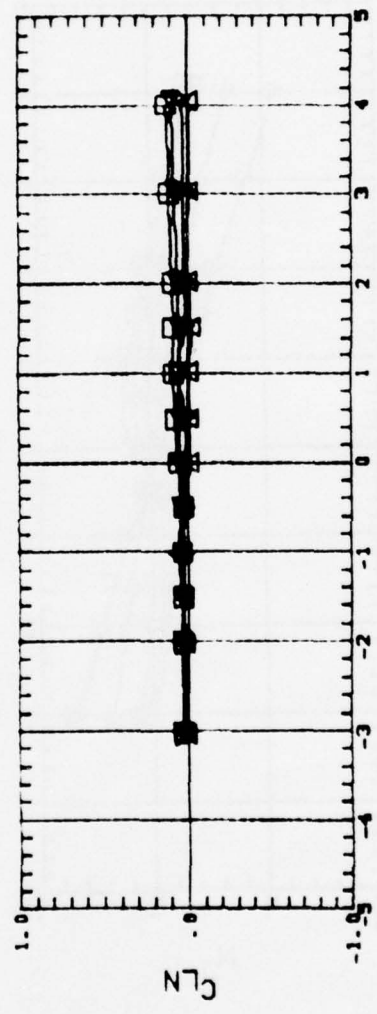


THRUST EFFECTS ON STABILITY COEFFICIENTS BF7
 ALPHA

860032
 REFERENCE INFORMATION
 GREF .850 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.
 PARAMETRIC VALUES
 PHI .00
 MACH 1.00
 AEDC TM350
 CRT SYMBOL CRT
 12.16 4 2.54
 .01
 6.08
 SYMBOL
 Δ
 □
 ▽



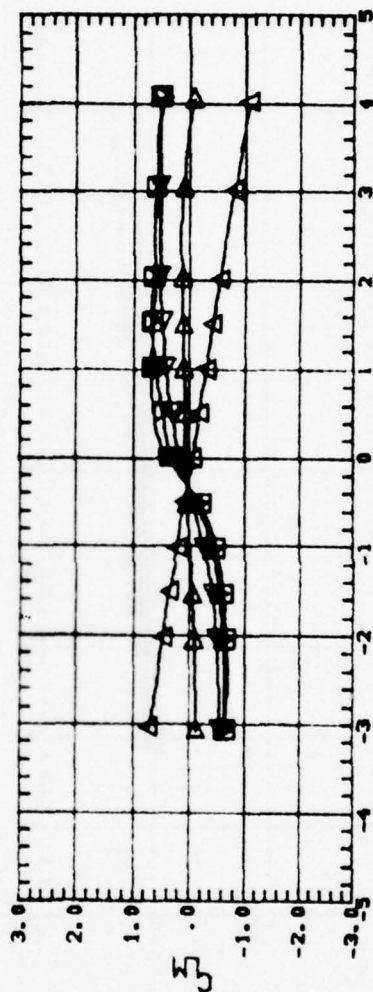
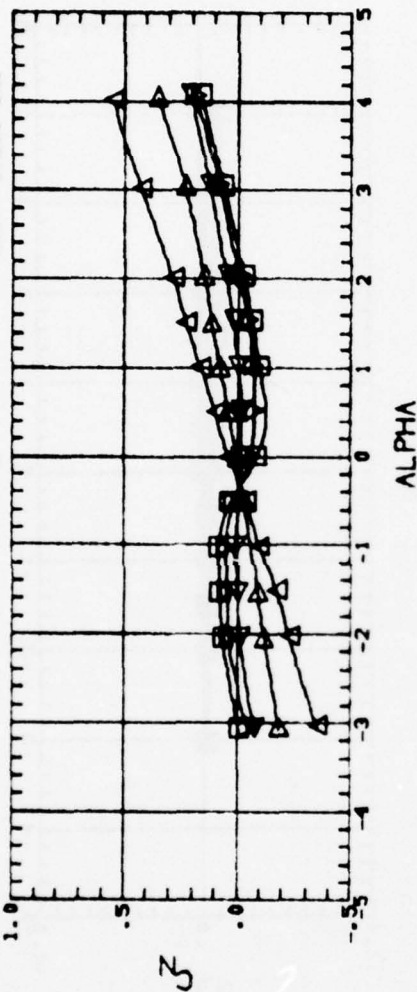
ALPHA



ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BF7

SYMBOL AEDC THUSO CRT PARAMETRIC VALUES REFERENCE INFORMATION
 Δ .01 4.21 PHI .00 SREF .958 80 IN.
 □ 7.21 2.51 MACH 1.25 LREF 1.108 IN.
 ▽ 6.01 XMRP 5.838 IN.



THRUST EFFECTS ON STABILITY COEFFICIENTS BF7

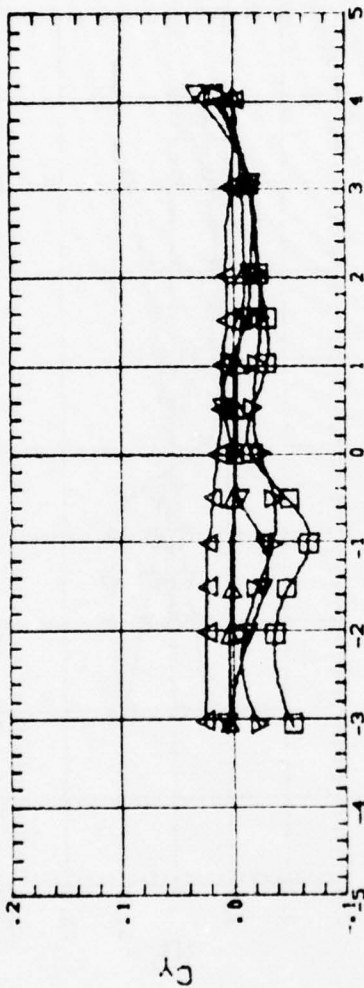
AEDC TN350
 CRT SYMBOL
 -01 Δ
 7.21 \square
 6.01 ∇

REFERENCE INFORMATION
 SREF .950 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.

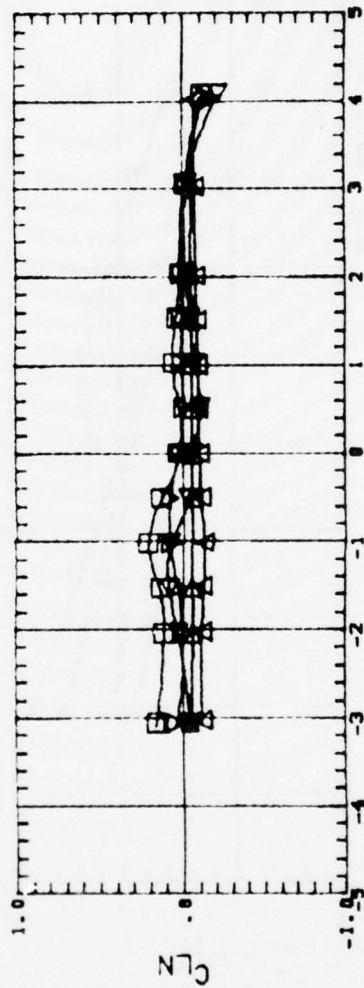
PARAMETRIC VALUES
 PHI .00
 MACH 1.25

CRT
 4.21
 2.51

BS0033



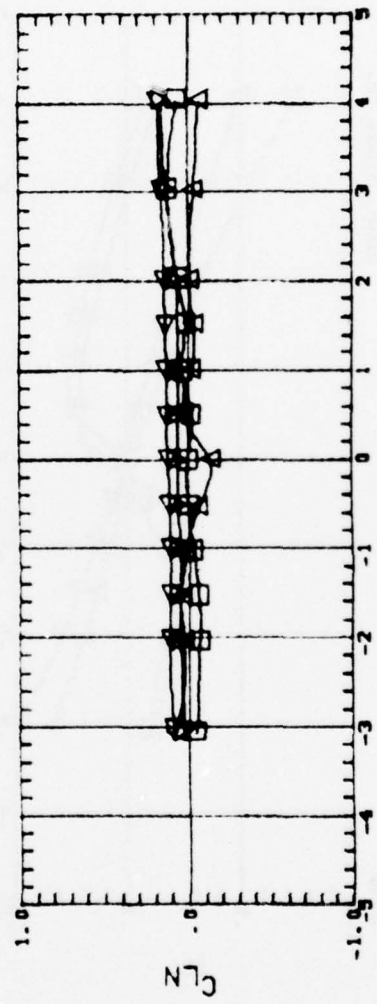
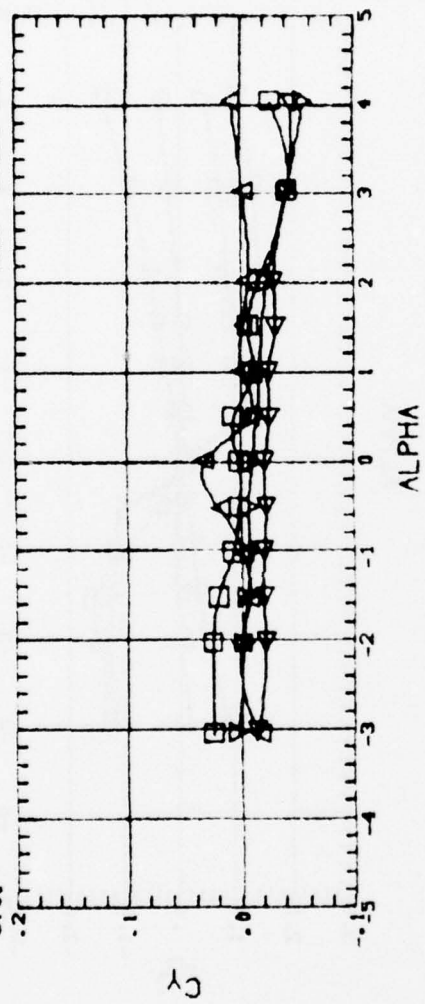
ALPHA



ALPHA

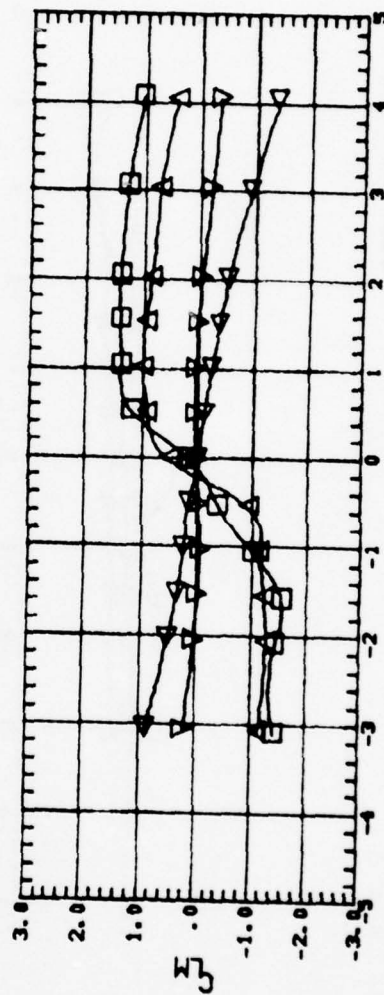
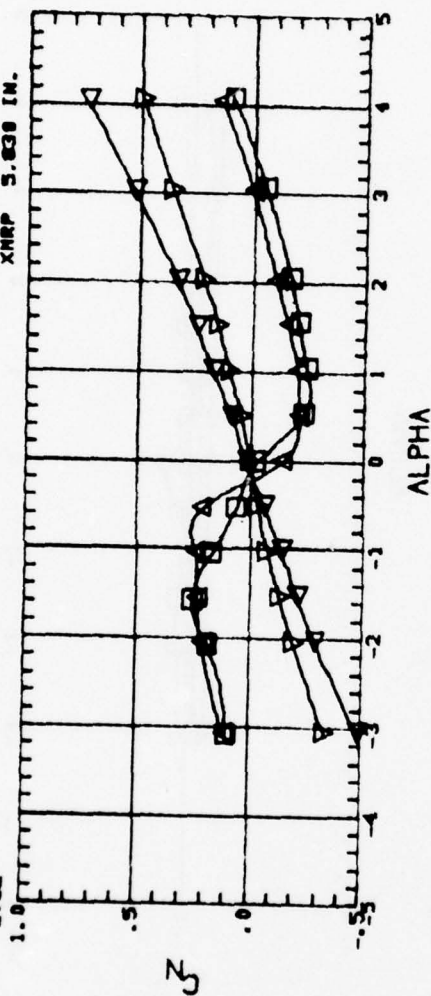
THRUST EFFECTS ON STABILITY COEFFICIENTS BF7

BS0034
 REFERENCE INFORMATION
 SREF .950 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.
 AEDC TM350
 CRT SYMBOL
 18.03 Δ
 9.03 □
 6.01 X
 PARAMETRIC VALUES
 PHI .00
 MACH .70
 CRT .01



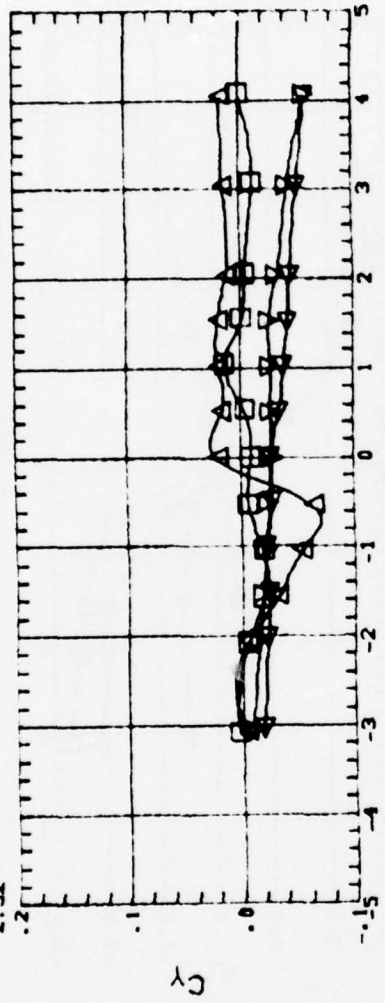
THRUST EFFECTS ON STABILITY COEFFICIENTS BF8

080035
REFERENCE INFORMATION
GREF .950 SQ. IN.
LREF 1.100 IN.
XMRP 5.830 IN.

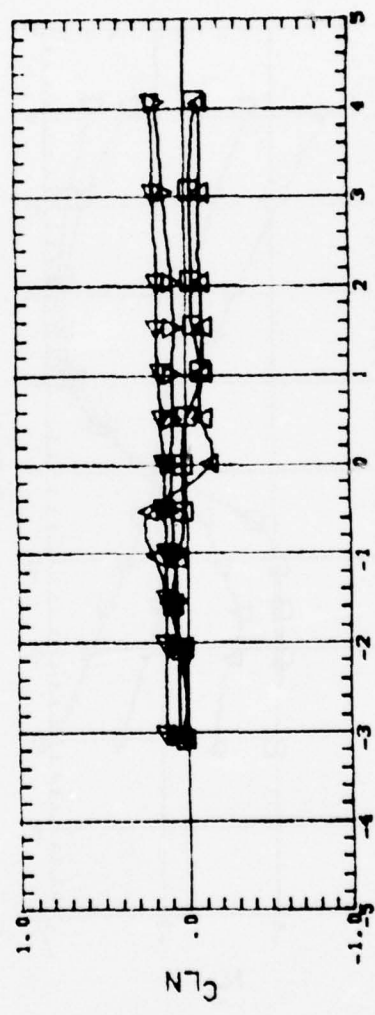


ALPHA
THRUST EFFECTS ON STABILITY COEFFICIENTS BF8

SYMBOL AEDC TMSO CRY SYMBOL CRY PARAMETRIC VALUES REFERENCE INFORMATION BR0035
 Δ 12.14 .01 Δ .01 PHI .00 SREF .850 SQ. IN.
 □ 6.11 MACH 1.00 LREF 1.100 IN.
 2.32 XMRP 5.830 IN.



ALPHA



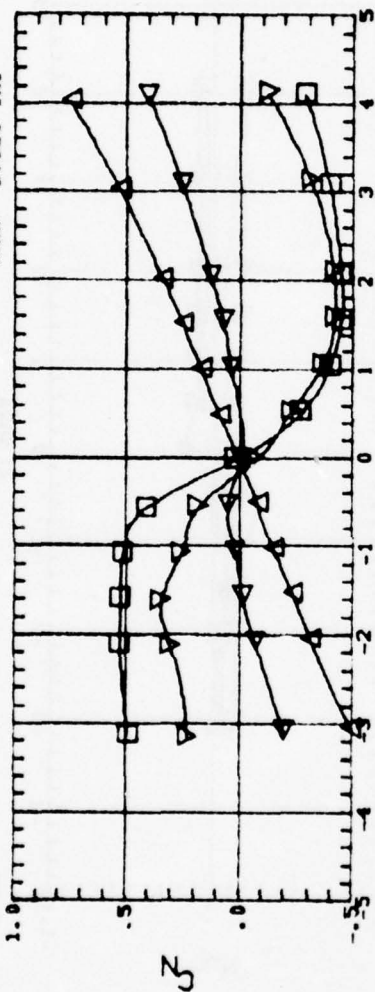
ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BF8

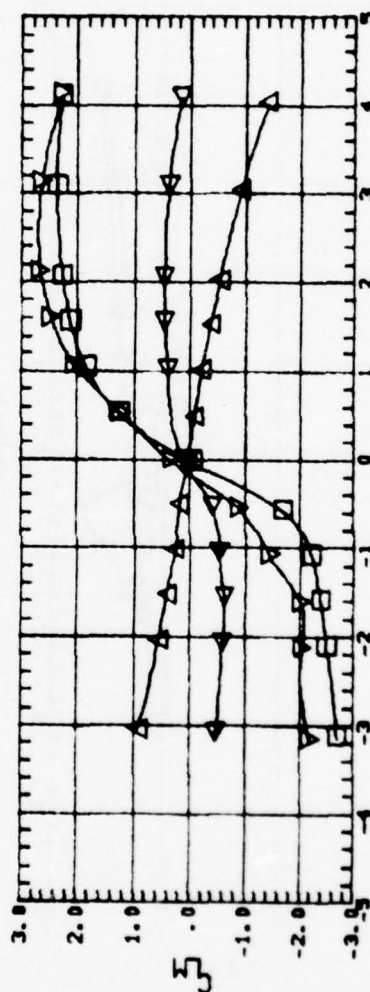
SYMBOL CRT SYMBOL CRT
 A -01 4
 □ 7.00
 ▽ 4.14

AEDC TAGS
 CRT 2.51
 SYMBOL 4

REFERENCE INFORMATION
 SREF .950 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.



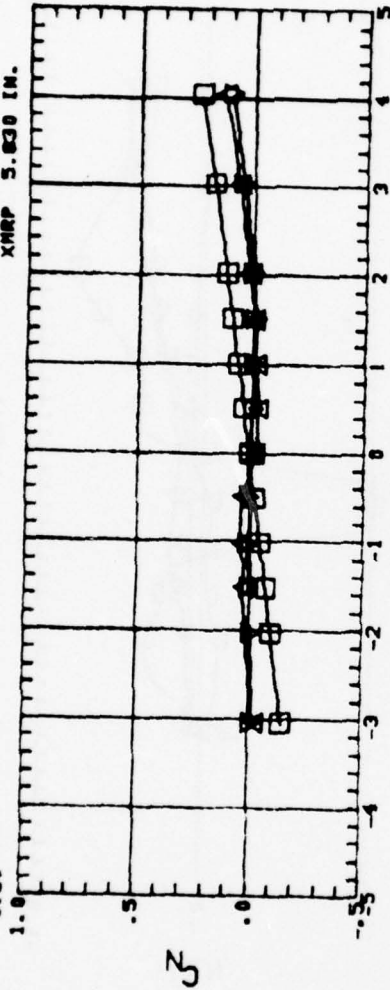
ALPHA



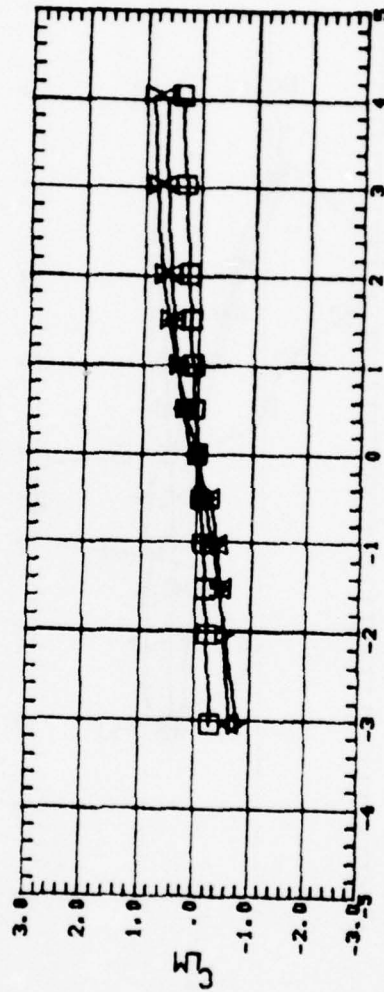
ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BF8

SYMBOL AEDC TAGS PARAMETRIC VALUES REFERENCE INFORMATION 88827
 Δ 17.54 PHI .00 SREF .850 IN.
 □ .01 MACH .70 LREF 1.100 IN.
 ▽ 0.91 XMRP 5.030 IN.



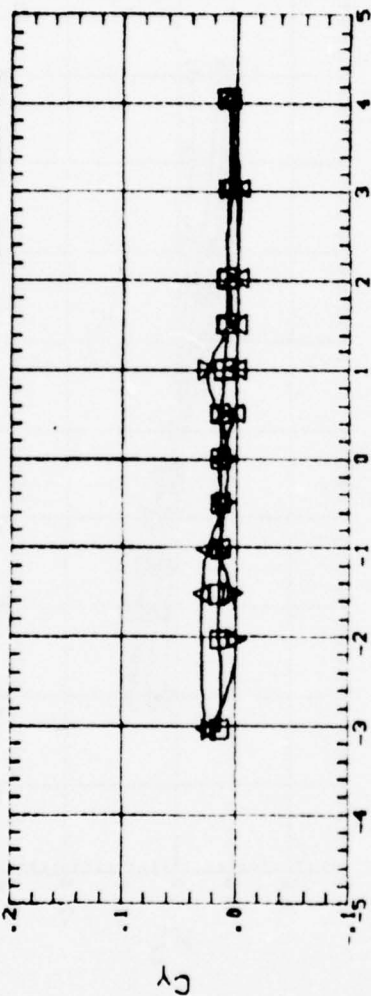
ALPHA



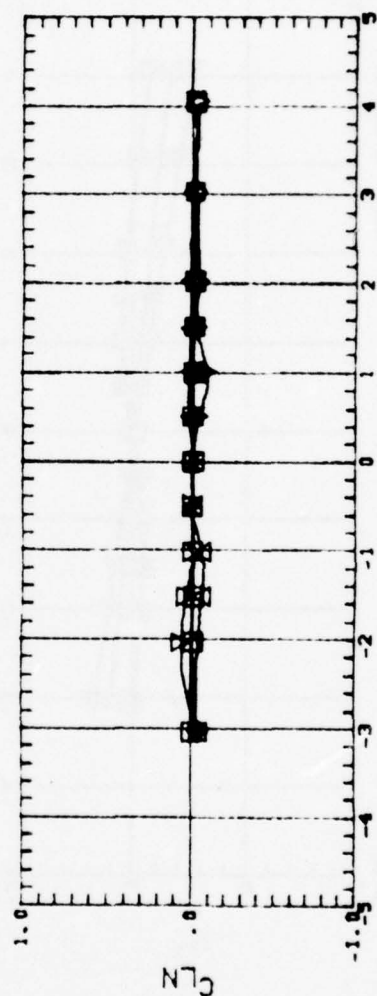
THRUST EFFECTS ON STABILITY COEFFICIENTS BS1

SYMBOL Δ \square
 AEDC TMS50 CRT
 17.94
 .01
 8.91
 PARAMETRIC VALUES
 PHI .00
 MACH .70
 REFERENCE INFORMATION
 SREF .850 SQ. IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.

BS0037



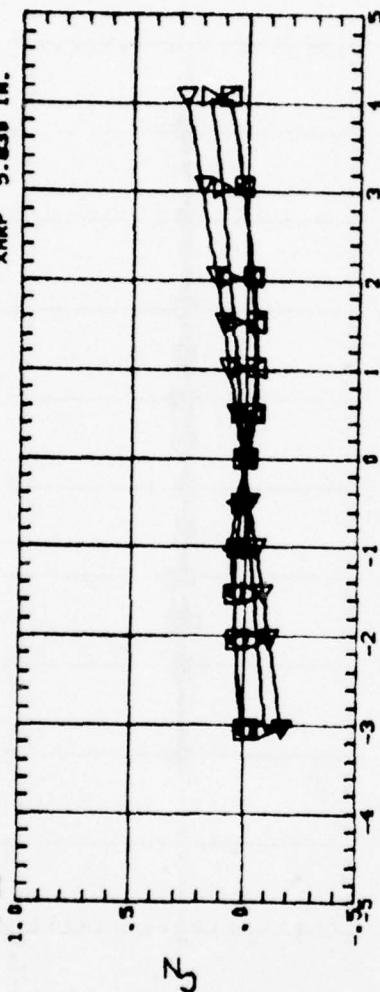
ALPHA



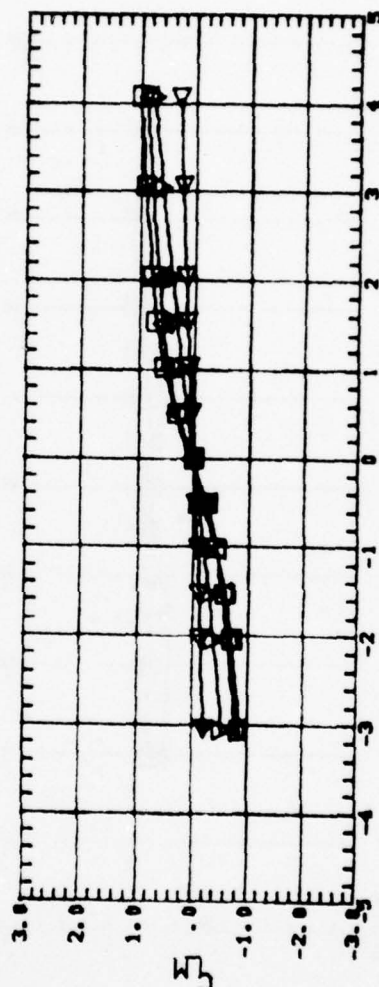
ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BSI

SYMBOL AEDC TMS50 CRT PARAMETRIC VALUES REFERENCE INFORMATION BS0038
 CRT SYMBOL PHI MACH SREF LREF XMRP
 8.58 4 .01 .00 .950 80. IN.
 5.58 1.00 1.100 IN.
 2.53 5.838 IN.

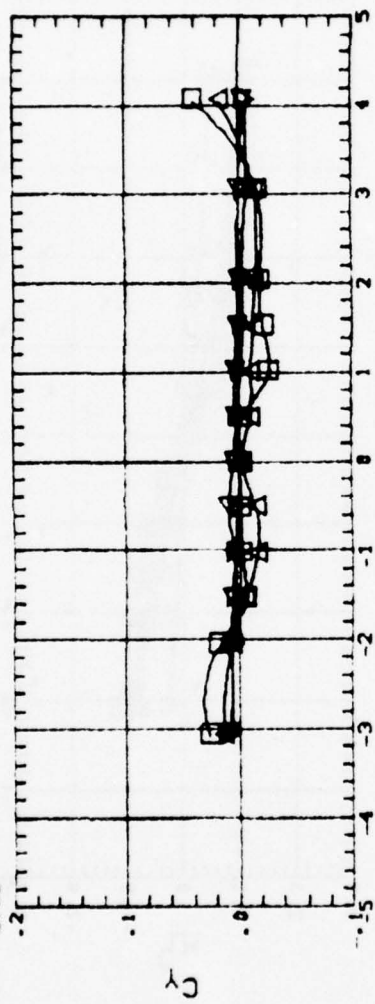


ALPHA

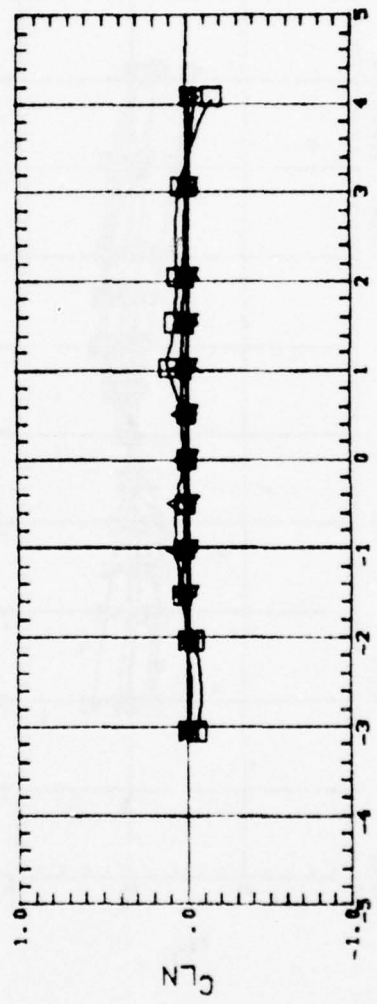


THRUST EFFECTS ON STABILITY COEFFICIENTS BS1
 ALPHA

SYMBOL AEDC TM350 CRT SYMBOL CRT PARAMETRIC VALUES REFERENCE INFORMATION 860030
 △ 0.98 4 △ .01 PHI .00 GREF .850 60 IN.
 □ 5.98 MACH 1.00 LREF 1.100 IN.
 △ 2.35 XMRP 5.830 IN.

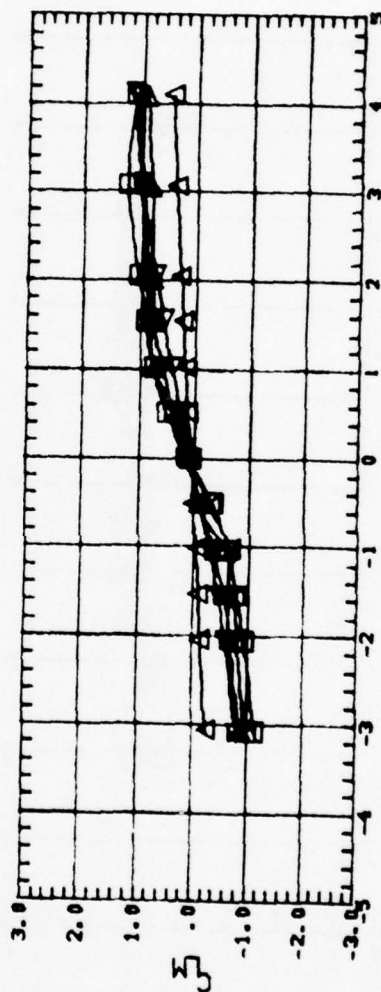
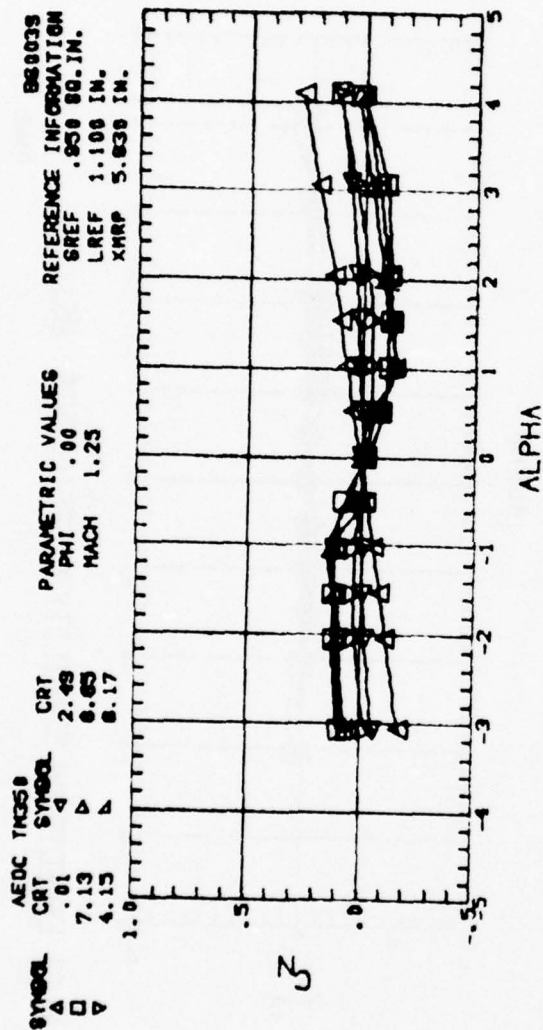


ALPHA



ALPHA

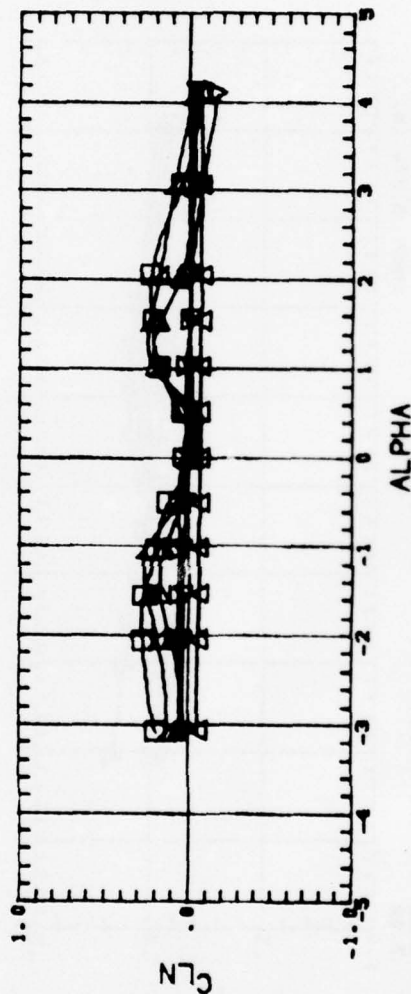
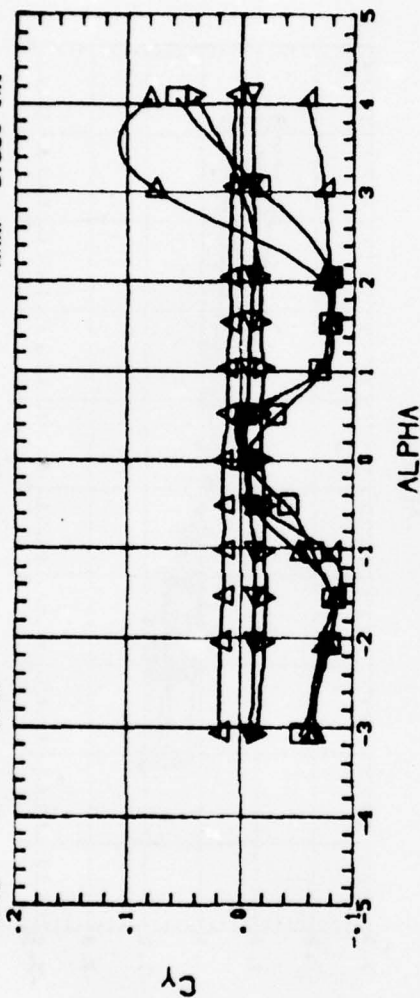
THRUST EFFECTS ON STABILITY COEFFICIENTS BSI



THRUST EFFECTS ON STABILITY COEFFICIENTS BSI

SYMBOL CRT SYMBOL CRT
 A .01 A 2.48
 B 7.13 B 8.65
 C 4.13 C 8.17

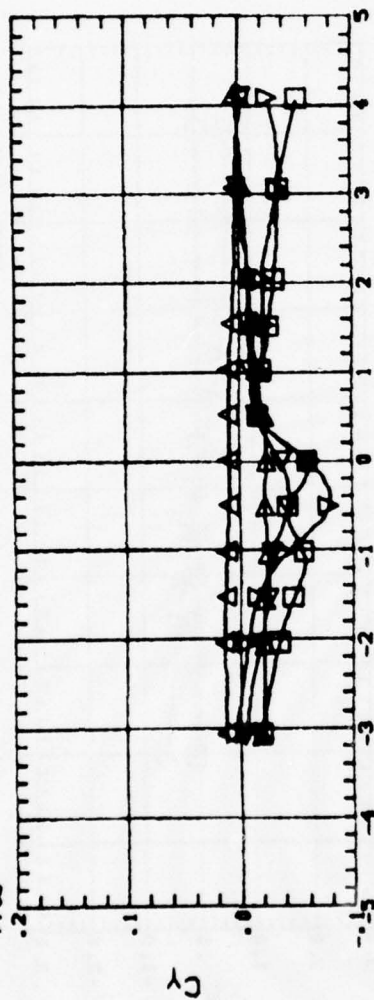
AEDC TH350
 REFERENCE INFORMATION
 SREF .858 80-IN.
 LREF 1.100 IN.
 XMRP 5.638 IN.



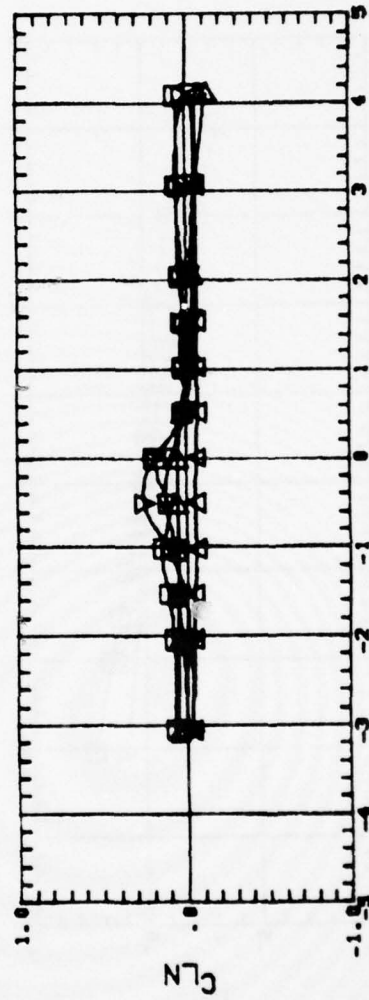
THRUST EFFECTS ON STABILITY COEFFICIENTS BS1

BSI 8040

AEDC TN350		PARAMETRIC VALUES		REFERENCE INFORMATION	
SYMBOL	CRT	SYMBOL	CRT	SYMBOL	CRT
△	0.01	△	4.14	△	43.00
□	0.08	□	4.14	□	1.00 IN.
▽	7.09	▽	4.14	▽	1.100 IN.
				×	5.838 IN.



ALPHA



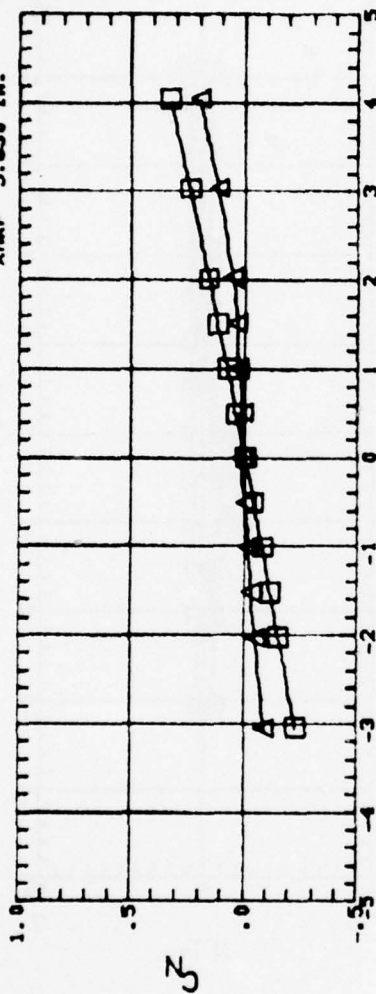
ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BSI

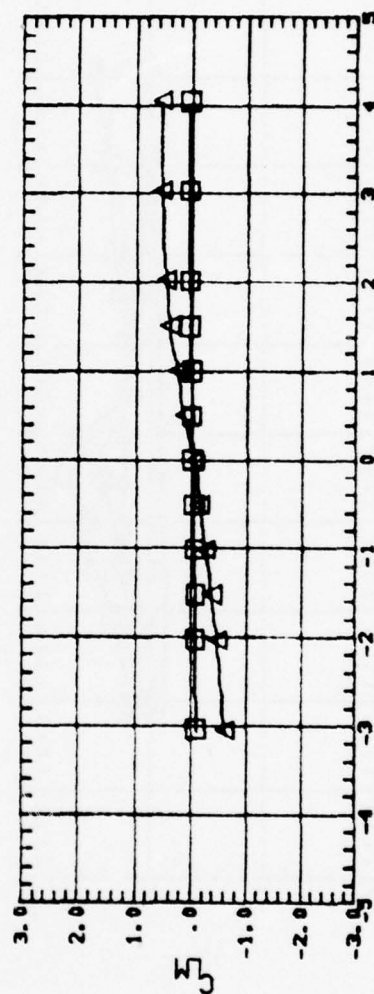
SYMBOL CRT
 Δ 0.01
 □ .01

AEDC TH0350
 BS0041
 REFERENCE INFORMATION
 SREF .850 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.

PARAMETRIC VALUES
 PHI .90
 MACH .70



ALPHA

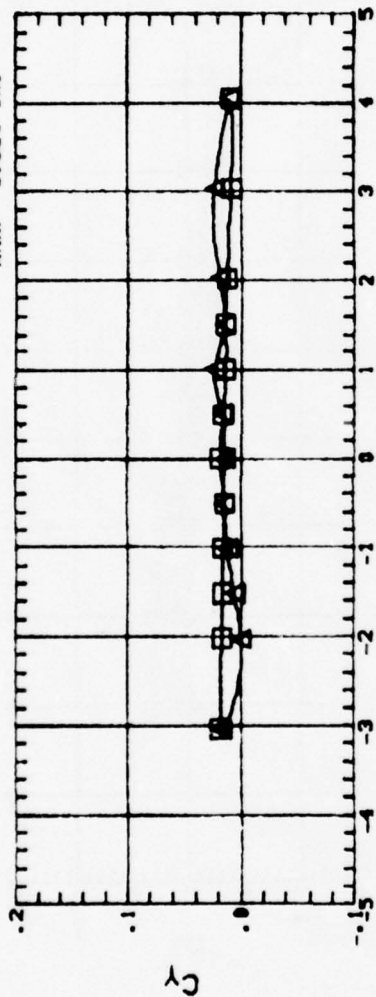


ALPHA

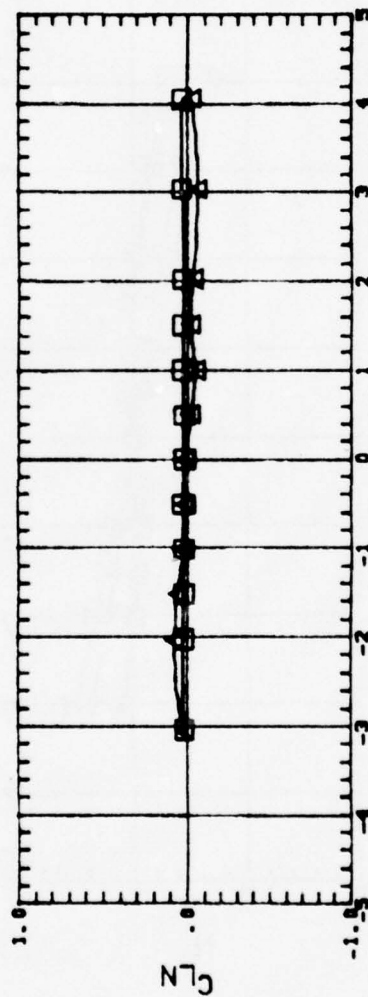
THRUST EFFECTS ON STABILITY COEFFICIENTS BS2

SYMBOL Δ \square
 AEDC THUSO
 CRT
 0.01
 .01
 BS8041
 REFERENCE INFORMATION
 SREF .830 80. IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.

PARAMETRIC VALUES
 PHI .60
 MACH .70



ALPHA



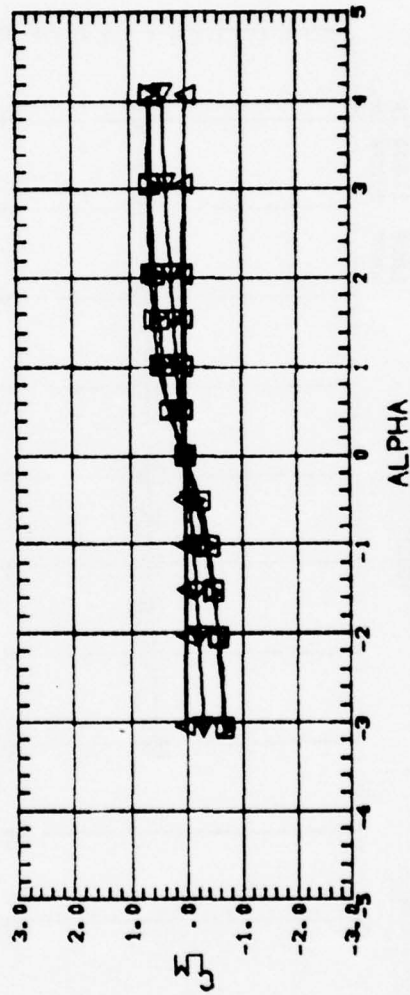
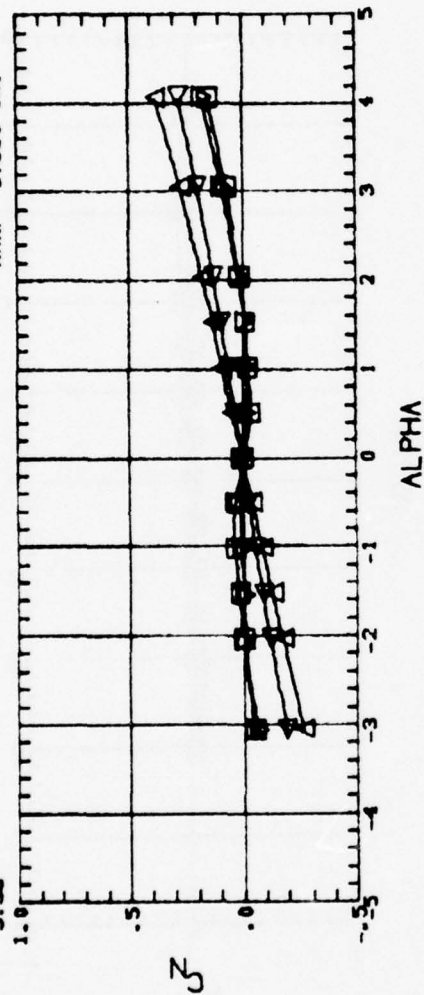
ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BS2

BS0042
 REFERENCE INFORMATION
 GREF .950 SQ. IN.
 LREF 1.100 IN.
 XMRP 5.838 IN.

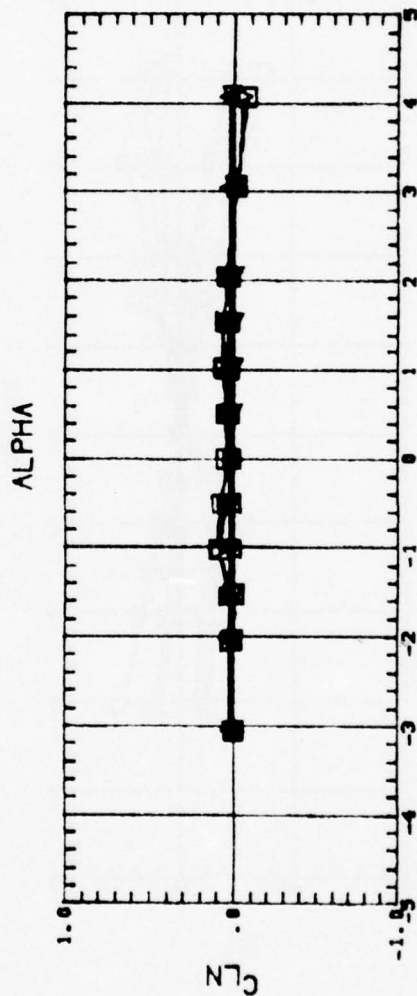
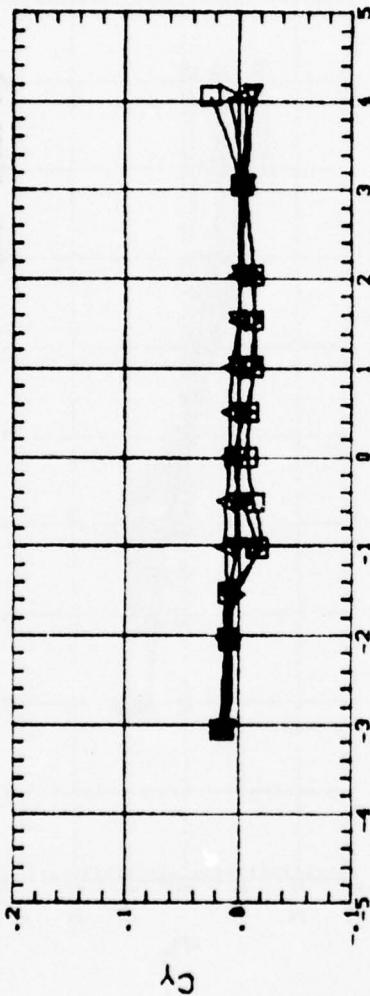
AEDC T10358
 CRT SYMBOL
 .01 4
 0.50
 5.38

PARAMETRIC VALUES
 PHI .00
 MACH 1.00

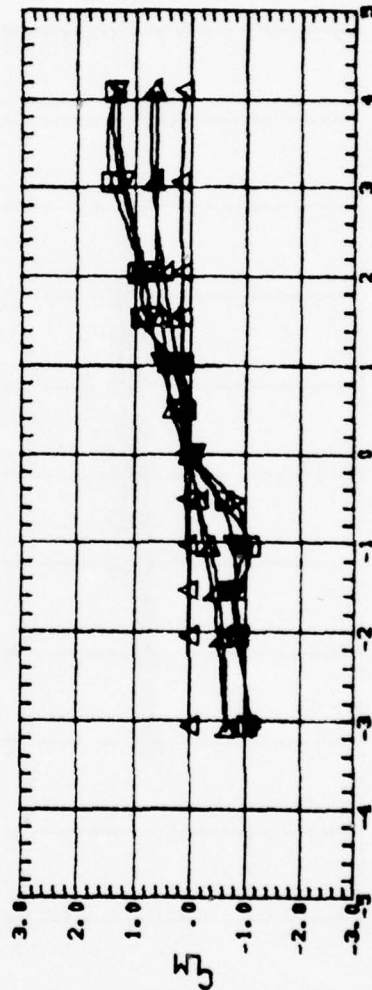
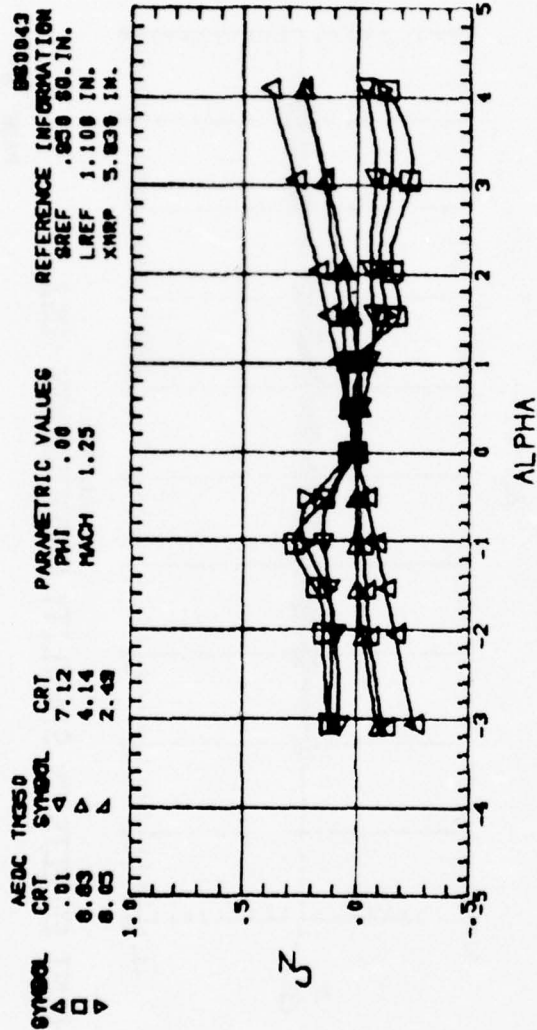


THRUST EFFECTS ON STABILITY COEFFICIENTS BS2

BS0042
 REFERENCE INFORMATION
 GREF .850 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.
 PARAMETRIC VALUES
 PHI .60
 MACH 1.60
 AEDC TK350
 CRT SYMBOL
 .01 4
 0.56
 5.56
 SYMBOL
 ▲
 □
 ▲



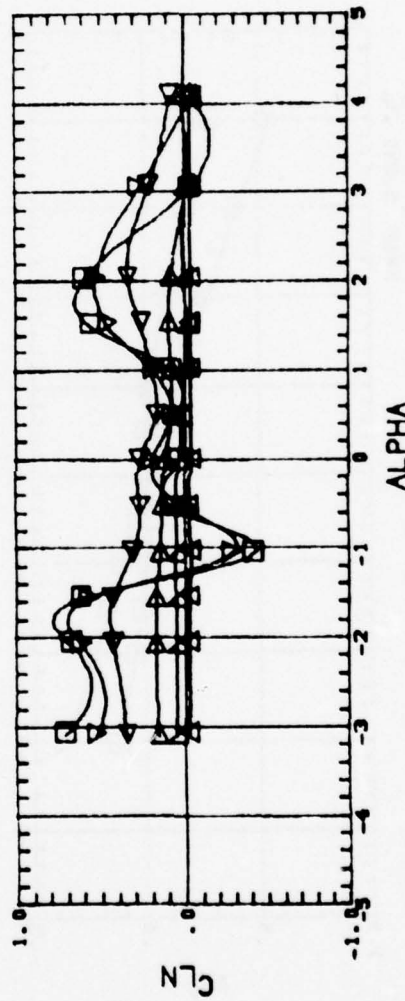
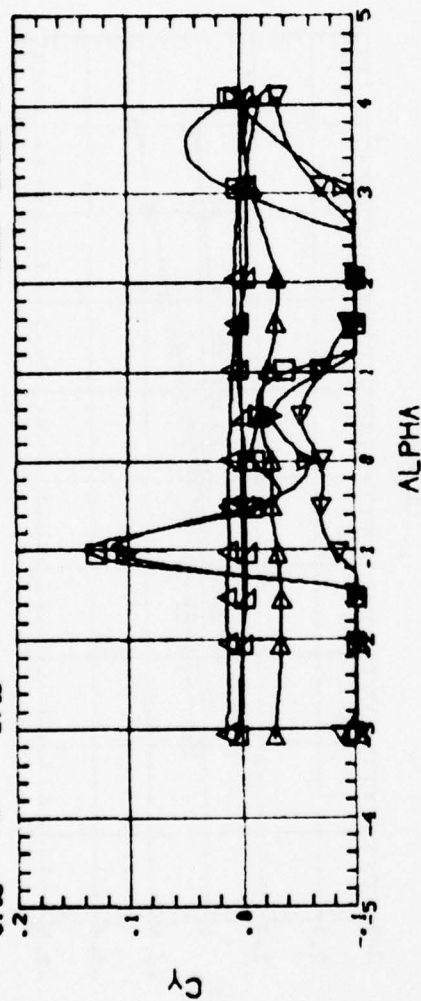
THRUST EFFECTS ON STABILITY COEFFICIENTS BS2
 ALPHA



THRUST EFFECTS ON STABILITY COEFFICIENTS BS2

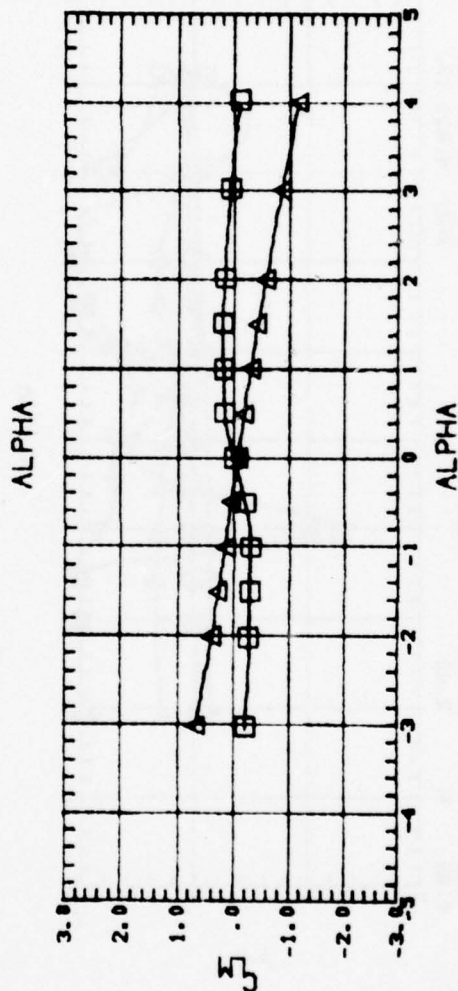
BS0943

AEDC TMS50		PARAMETRIC VALUES		REFERENCE INFORMATION	
SYMBOL	CRT	SYMBOL	CRT	SYMBOL	VALUE
Δ	.01	Φ	7.12	GREF	.958 SQ. IN.
\square	0.63	$MACH$	1.25	LREF	1.100 IN.
∇	0.03			XMRP	5.830 IN.



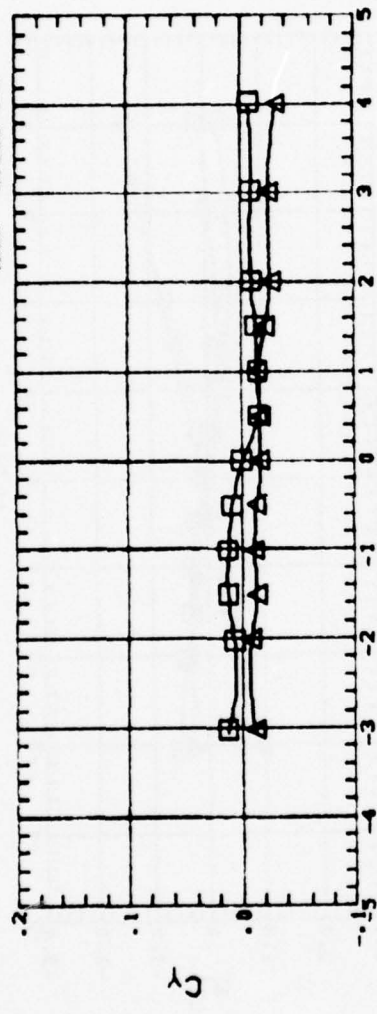
THRUST EFFECTS ON STABILITY COEFFICIENTS BS2

α	Z (Squares)	Z (Triangles)
-4.0	-0.25	-0.25
-3.0	-0.15	-0.10
-2.0	-0.05	0.00
-1.0	0.00	0.05
0.0	0.05	0.05
1.0	0.10	0.00
2.0	0.15	0.05
3.0	0.20	0.10
4.0	0.25	0.15

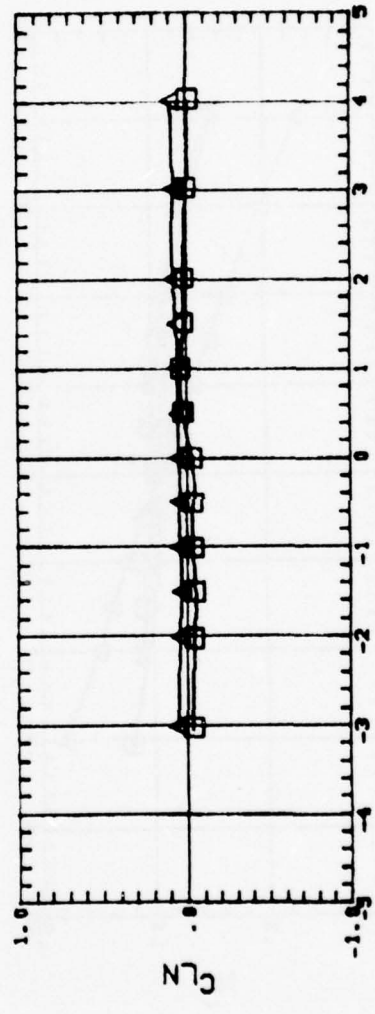


ALPHA
THRUST EFFECTS ON STABILITY COEFFICIENTS BF7SI

858044
 REFERENCE INFORMATION
 GREF .930 IN.
 LREF 1.108 IN.
 XMRP 5.830 IN.
 PARAMETRIC VALUES
 PHI .00
 MACH .70
 AEDC TNGS
 CRT
 17.53
 SYMBOL
 Δ
 □



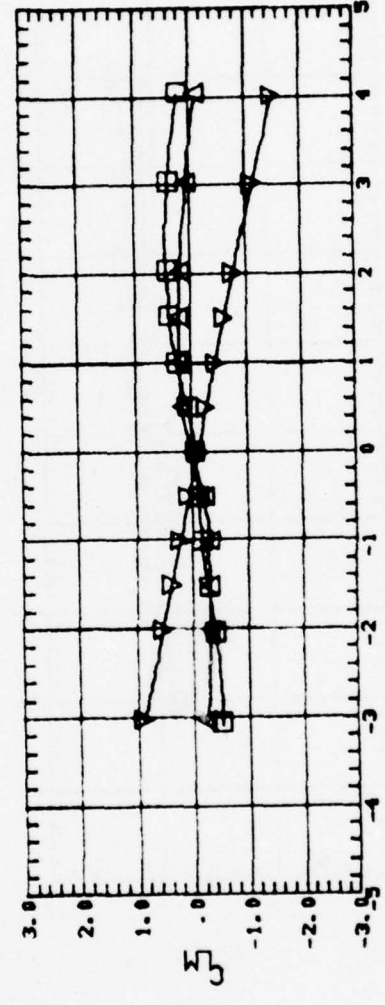
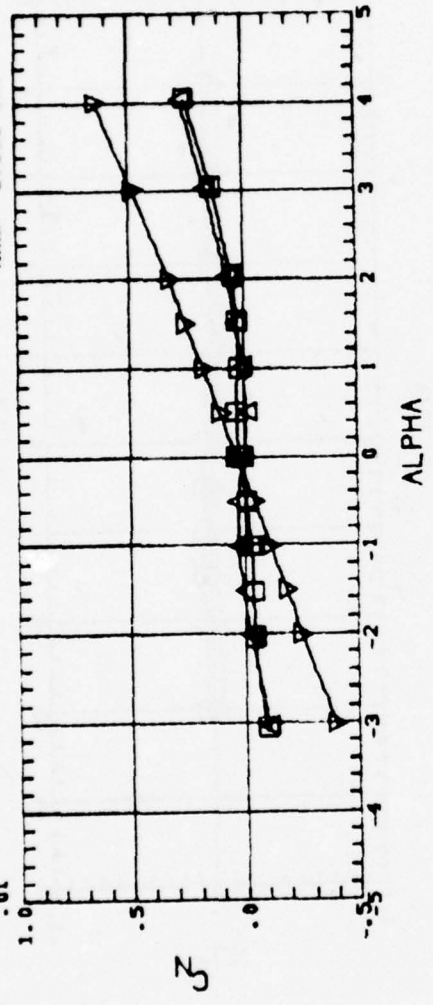
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ALPHA

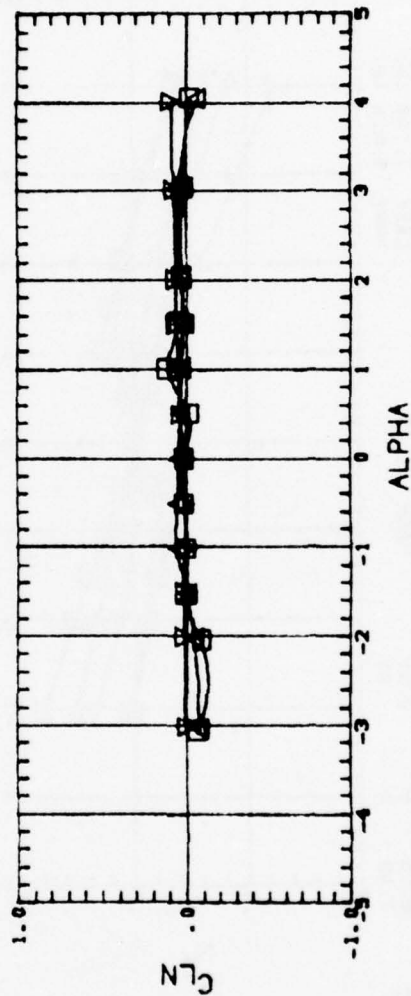
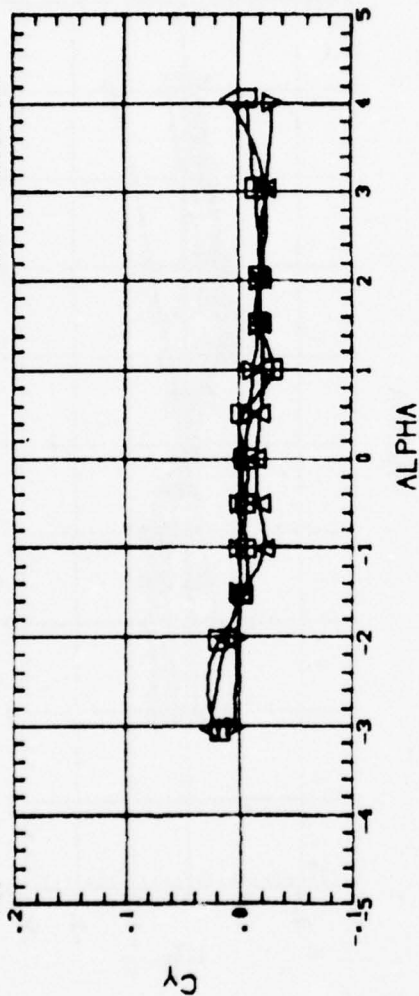
THRUST EFFECTS ON STABILITY COEFFICIENTS BF7S1

SYMBOL AEDC TH350 REFERENCE INFORMATION
 Δ 11.91 SREF .850 80 IN.
 □ 5.50 LREF 1.100 IN.
 ▽ .01 XMRP 5.830 IN.



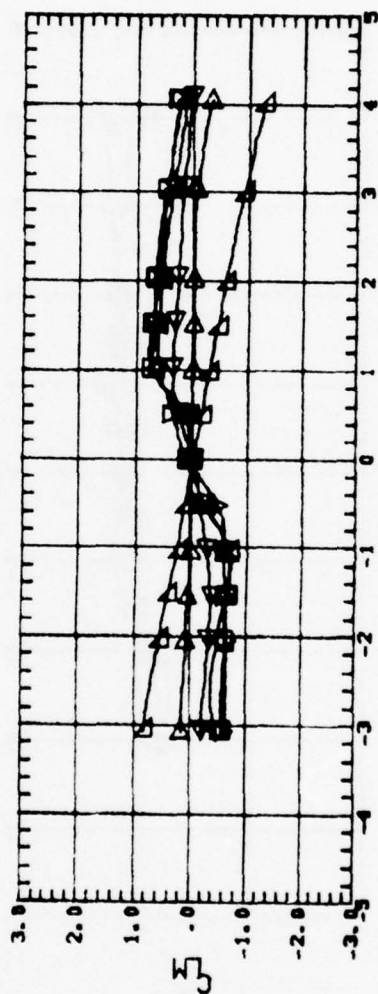
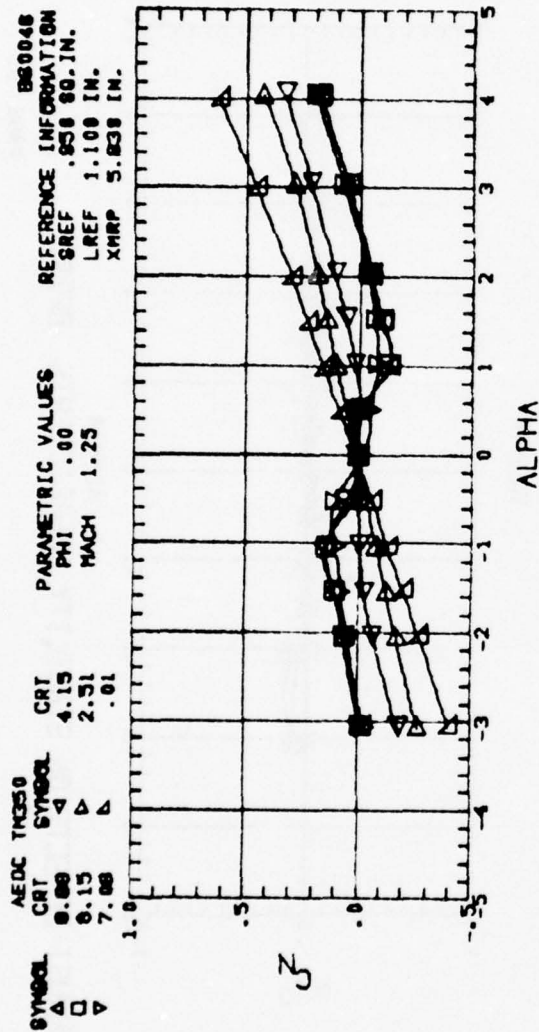
THRUST EFFECTS ON STABILITY COEFFICIENTS BF7S1

SYMBOL AEDC TH358 PARAMETRIC VALUES REFERENCE INFORMATION 060045
 △ CRT PHI .00 GREF .050 60 IN.
 □ 11.91 MACH 1.00 LREF 1.100 IN.
 ▽ 5.96 XMRP 5.038 IN.
 .01



THRUST EFFECTS ON STABILITY COEFFICIENTS BF751

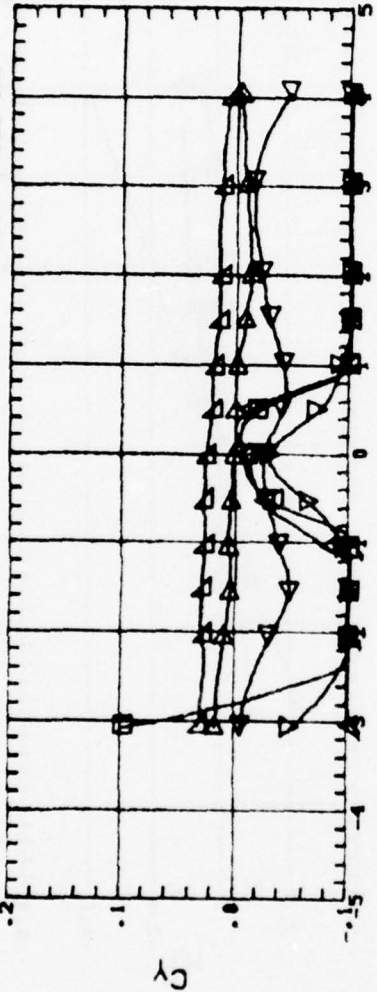
880048
 REFERENCE INFORMATION
 SREF .958 80 IN.
 LREF 1.100 IN.
 XMRP 5.838 IN.



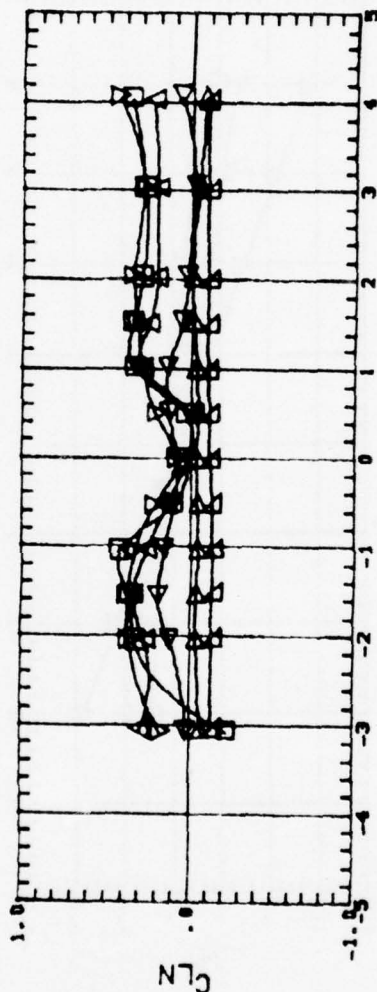
THRUST EFFECTS ON STABILITY COEFFICIENTS BF7S1

BS9048

SYMBOL		AEDC TH356		PARAMETRIC VALUES		REFERENCE INFORMATION	
□	8.08	CRT	4.15	PHI	.80	GREF	.850 SQ. IN.
△	6.15	SYMBOL	2.51	MACH	1.25	LREF	1.100 IN.
	7.08		.01			XMRP	5.830 IN.



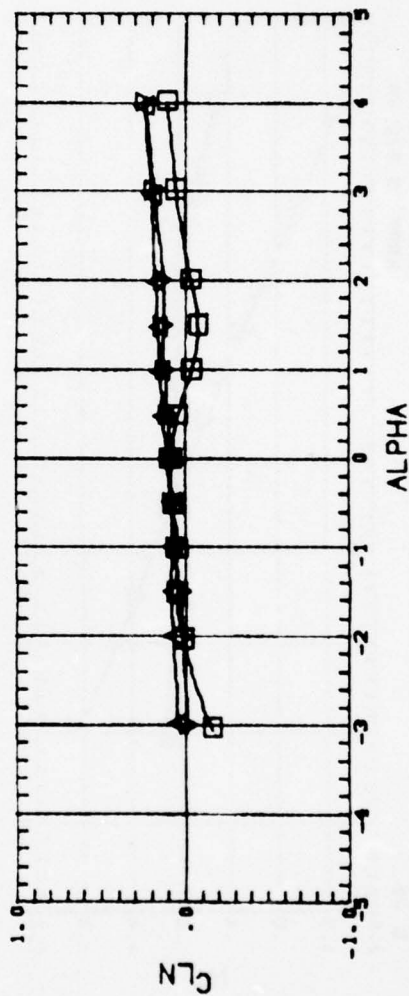
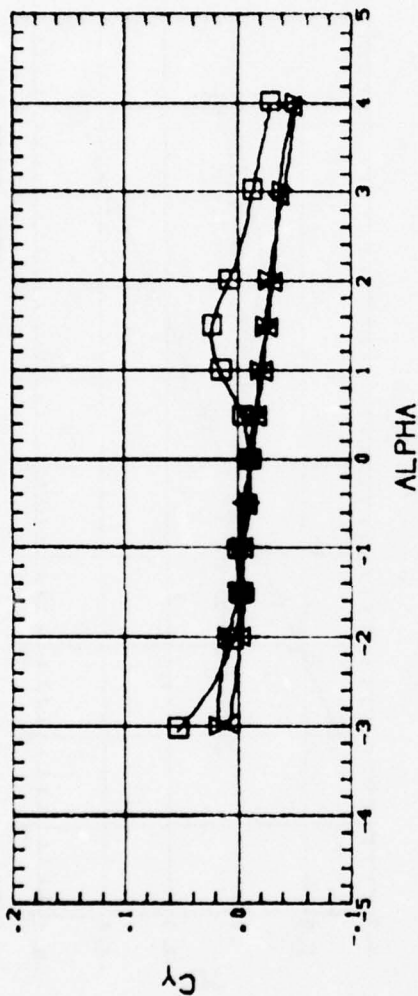
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ALPHA

THRUST EFFECTS ON STABILITY COEFFICIENTS BF7S1

SYMBOL AEDC TMS50 PARAMETRIC VALUES REFERENCE INFORMATION BF0047
 CRT PHI .00 SREF .950 90. IN.
 .01 MACH .70 LREF 1.100 IN.
 0.94 XMRP 5.030 IN.
 5.94



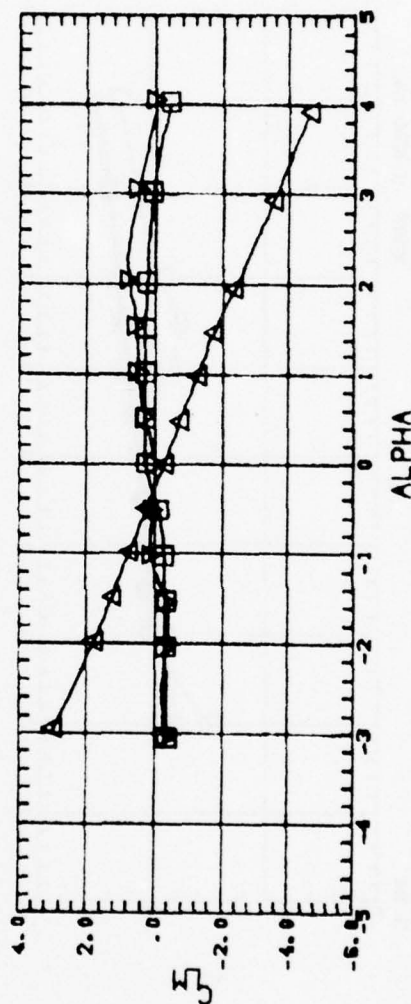
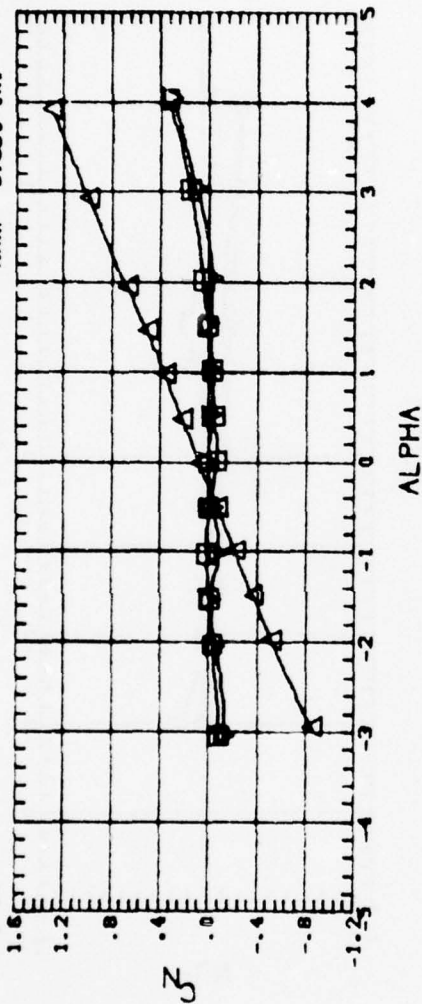
THRUST EFFECTS ON STABILITY COEFFICIENTS BF551

SYMBOL AEDC TH350
 Δ CRT
 □ .81
 ▽ 11.98
 6.00

PARAMETRIC VALUES
 PHI .00
 MACH 1.00

REFERENCE INFORMATION
 SREF .950 SQ. IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.

BS0048



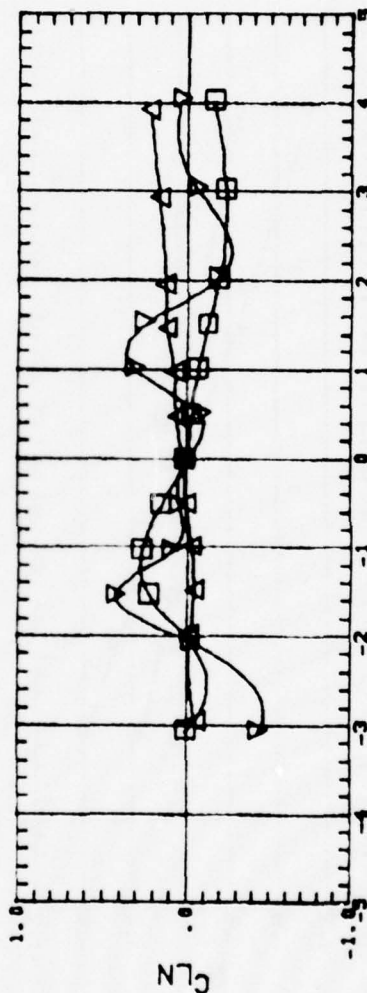
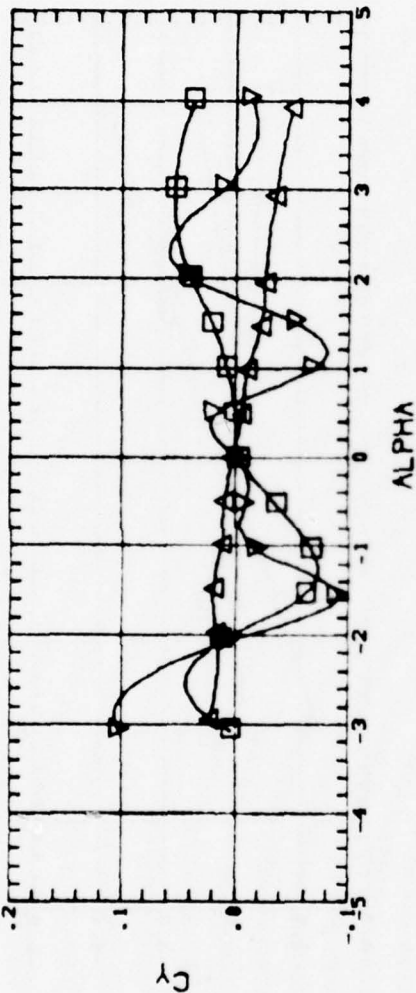
THRUST EFFECTS ON STABILITY COEFFICIENTS BF5S1

SYMBOL AEDC THUSO
 Δ CRT
 □ .01
 11.56
 6.00

PARAMETRIC VALUES
 PHI .00
 MACH 1.00

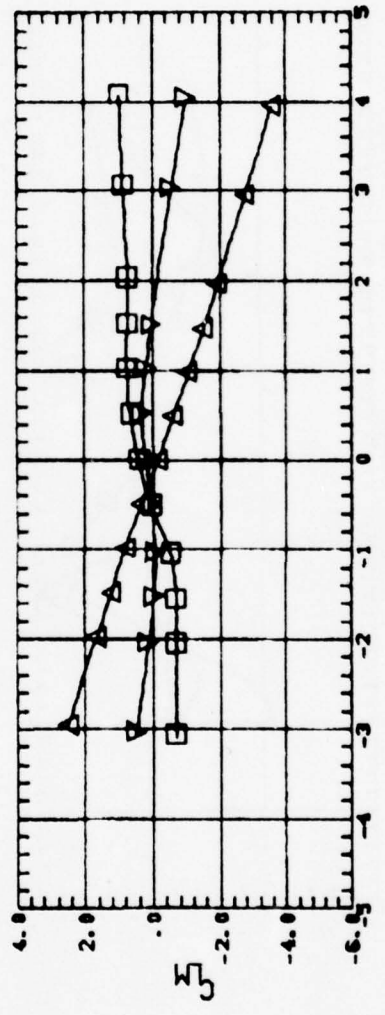
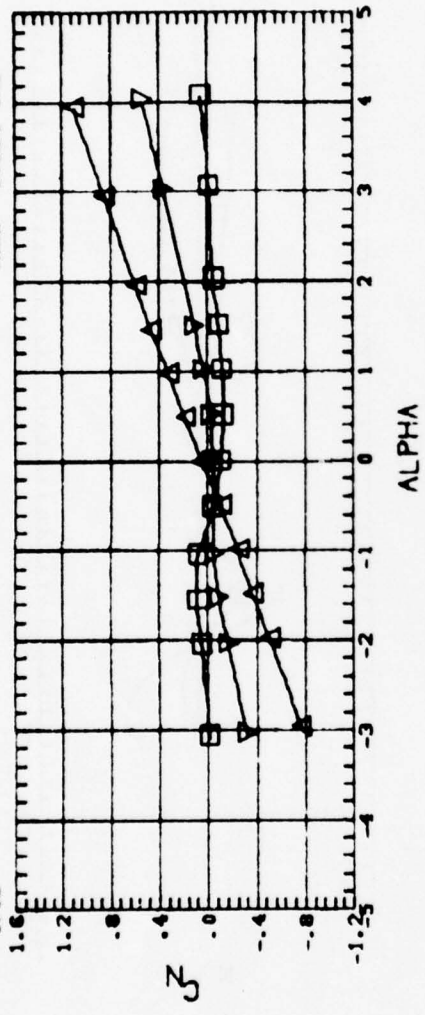
REFERENCE INFORMATION
 SREF .850 SQ. IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.

880048



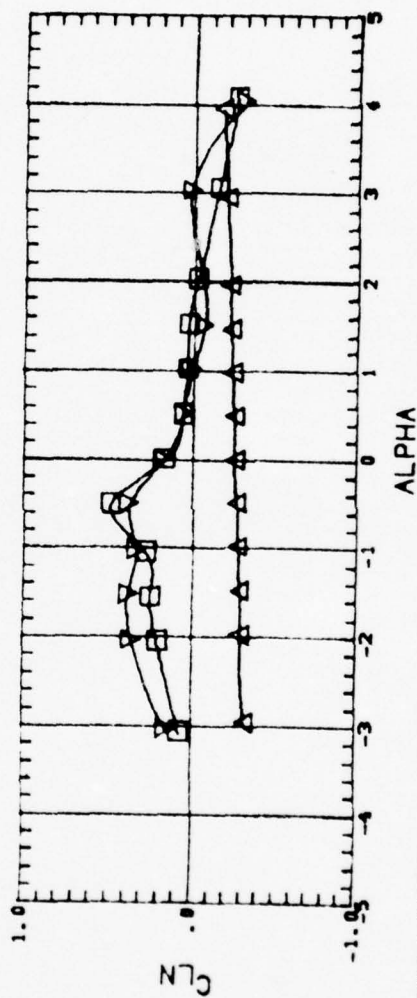
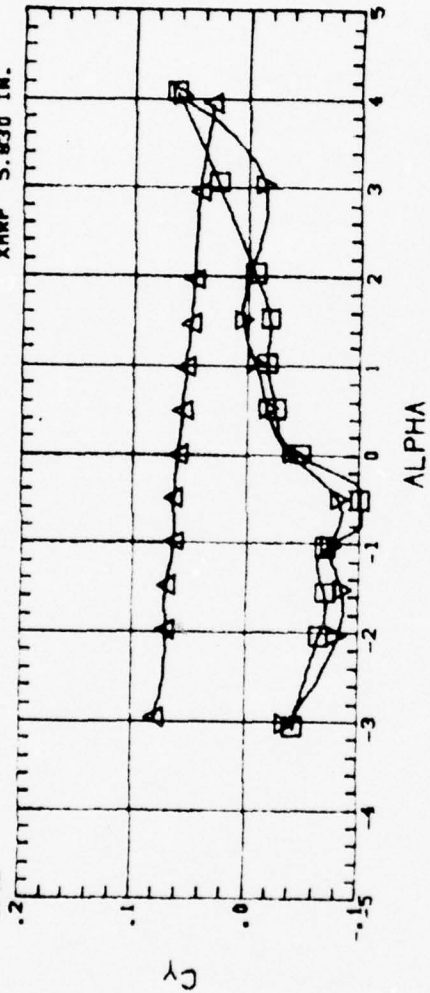
THRUST EFFECTS ON STABILITY COEFFICIENTS BF5S1

SYMBOL AEDC TH350 PARAMETRIC VALUES REFERENCE INFORMATION
 CRT PHI MACH SREF LREF XMRP
 Δ .81 .90 .950 IN.
 □ 7.10 1.25 1.100 IN.
 ▽ 4.18 5.830 IN.



THRUST EFFECTS ON STABILITY COEFFICIENTS BF551

SYMBOL Δ \square
 AEDC 1M350 CRT
 .01
 7.10
 4.15
 PARAMETRIC VALUES
 PHI .00
 MACH 1.25
 REFERENCE INFORMATION
 SREF .850 IN.
 LREF 1.100 IN.
 XMRP 5.830 IN.



THRUST EFFECTS ON STABILITY COEFFICIENTS BF5S1

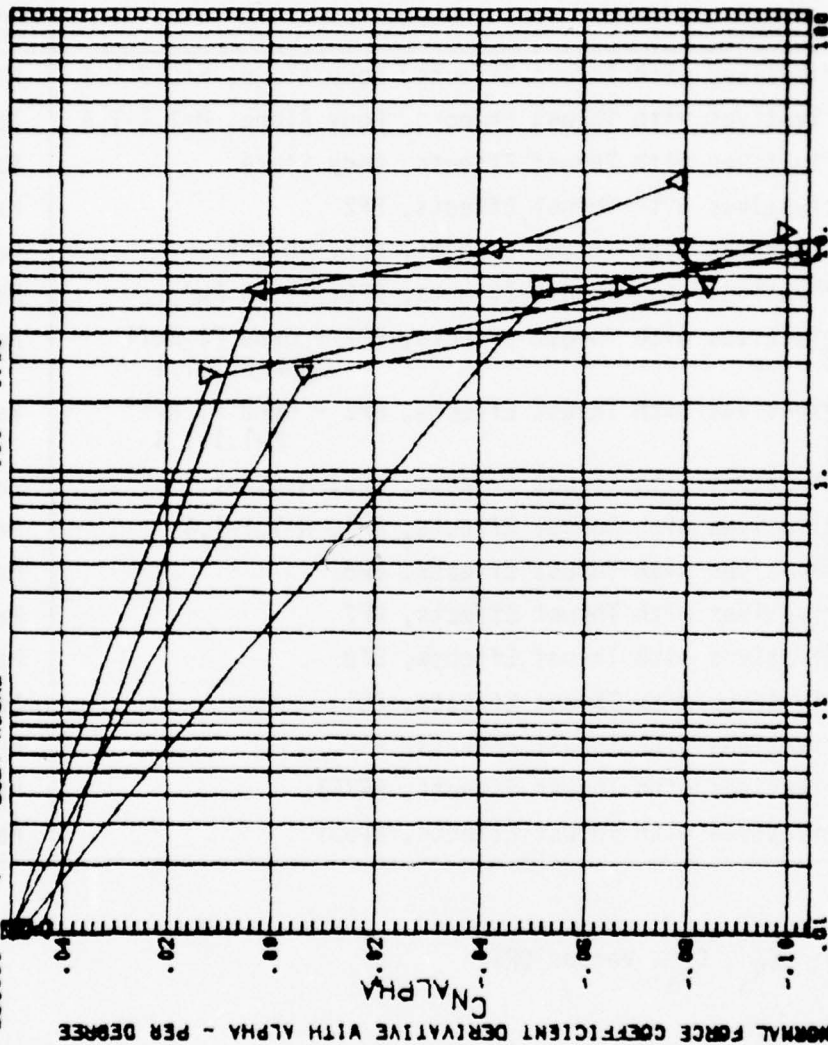
APPENDIX B
SLOPES AT ZERO ANGLE OF ATTACK

INDEX OF SLOPE FIGURES

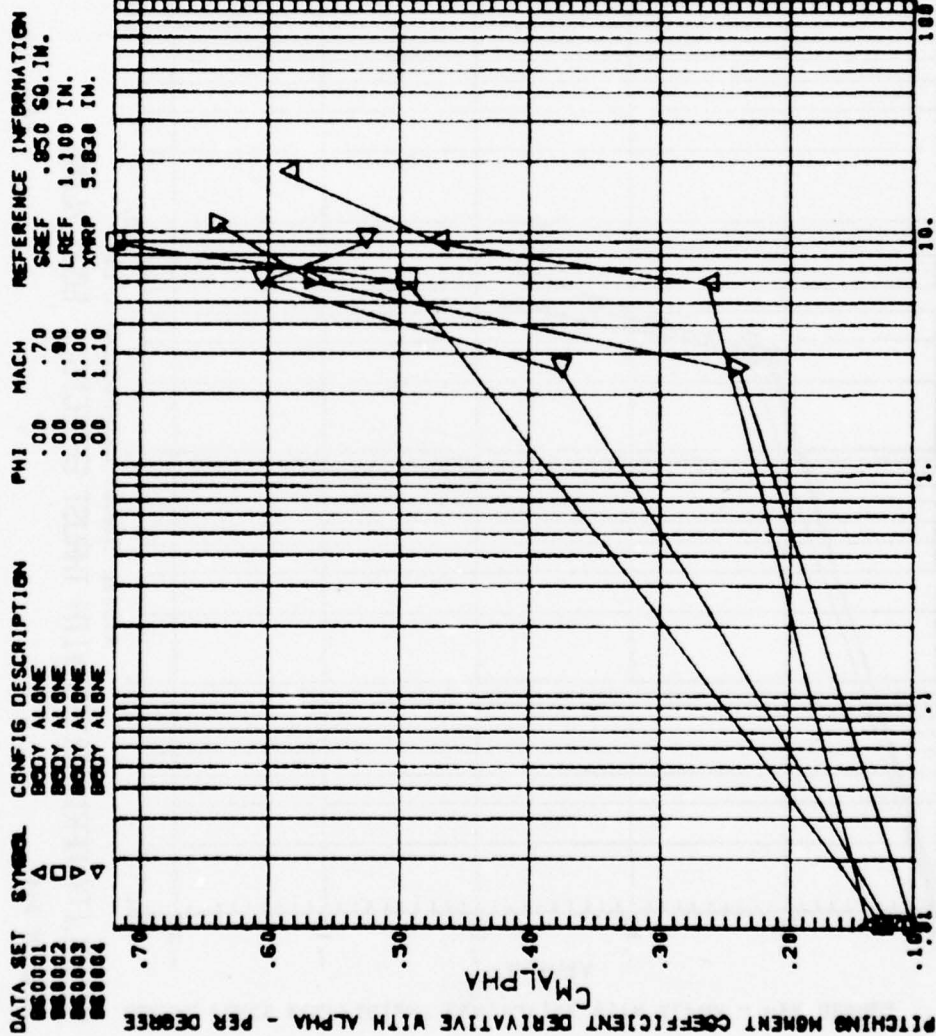
TITLE	CONDITION VARYING	PAGE
Stability Derivatives with Thrust Effects, Body Alone, M=0.7-1.1	Mach	2
Stability Derivatives with Thrust Effects, Body Alone, M=1.1-1.4	Mach	4
Stability Derivatives with Thrust Effects, Body Flare	Mach	6
Stability Derivatives with Thrust Effects, BF2	Mach	8
Stability Derivatives with Thrust Effects, BF2, $\Phi=45^\circ$	Mach	10
Stability Derivatives with Thrust Effects, BF2, (1.65 Fwd)	Mach	12
Stability Derivatives with Thrust Effects, BF2 + Grnd P1 Ref1 M=0.7-1.1	Mach	14
Stability Derivatives with Thrust Effects, BF2 + Grnd P1 Ref1 M=1.1-1.4	Mach	16
Stability Derivatives with Thrust Effects, BF5, M=0.7-1.1	Mach	18
Stability Derivatives with Thrust Effects, BF5, M=1.1-1.4	Mach	20
Stability Derivatives with Thrust Effects, BF6	Mach	22
Stability Derivatives with Thrust Effects, BF7	Mach	24
Stability Derivatives with Thrust Effects, BF8	Mach	26
Stability Derivatives with Thrust Effects, BS1	Mach	28
Stability Derivatives with Thrust Effects, BS2	Mach	30
Stability Derivatives with Thrust Effects, BF7S1	Mach	32
Stability Derivatives with Thrust Effects, BF5S1	Mach	34

Plot Schedule: C_{N_α} , C_{m_α} versus CRT

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0001	Δ	BODY ALONE	.00	.70	SREF .950 SQ. IN.
BS0002	□	BODY ALONE	.00	.90	LREF 1.100 IN.
BS0003	▽	BODY ALONE	.00	1.00	XREF 5.830 IN.
BS0004	◁	BODY ALONE	.00	1.10	

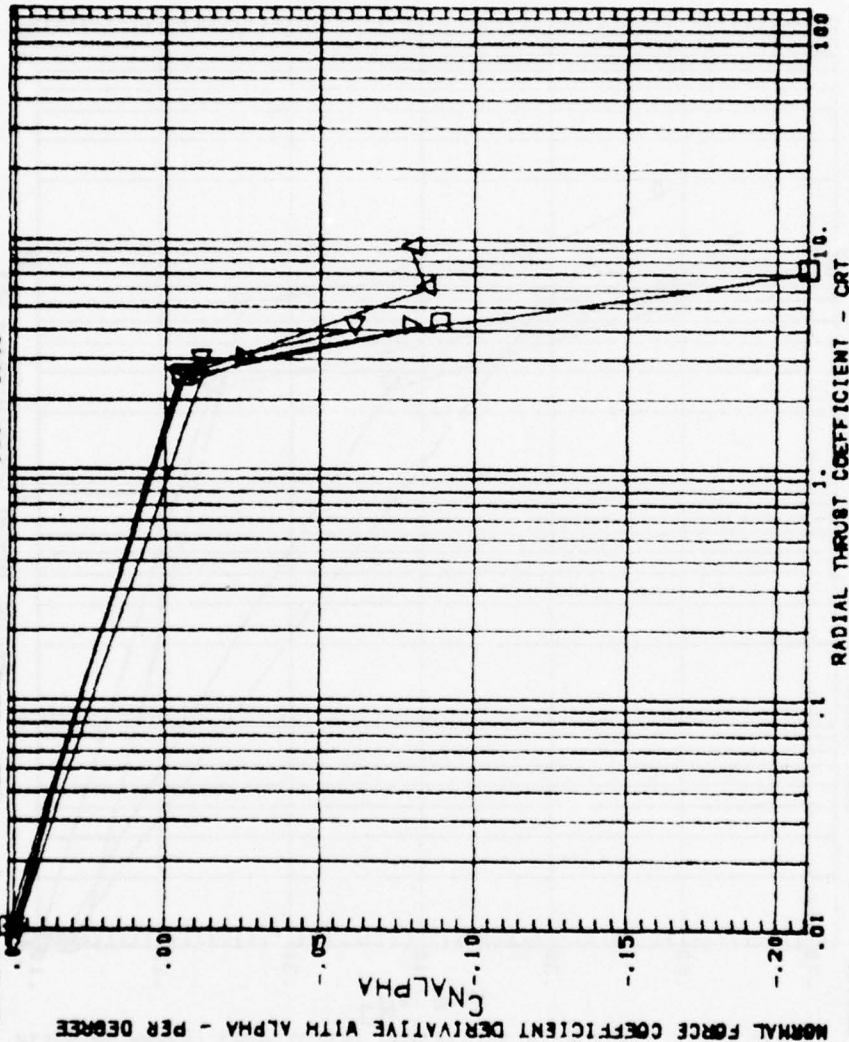


STABILITY DERIVATIVES WITH THRUST EFFECTS BODY ALONE



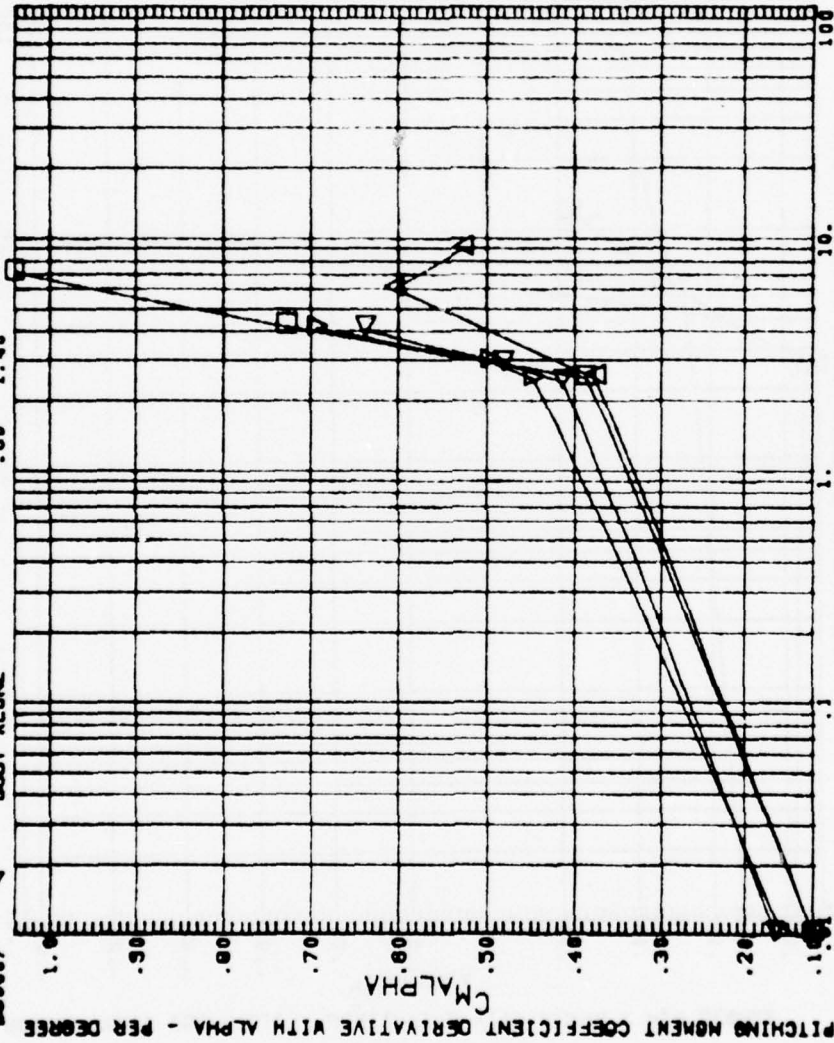
STABILITY DERIVATIVES WITH THRUST EFFECTS BODY ALONE

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION		
BS0004	△	BODY ALONE	.00	1.10	SREF	.950 SQ. IN.	
BS0005	□	BODY ALONE	.00	1.25	LREF	1.100 IN.	
BS0006	▽	BODY ALONE	.00	1.35	XMRP	5.838 IN.	
BS0007	△	BODY ALONE	.00	1.40			



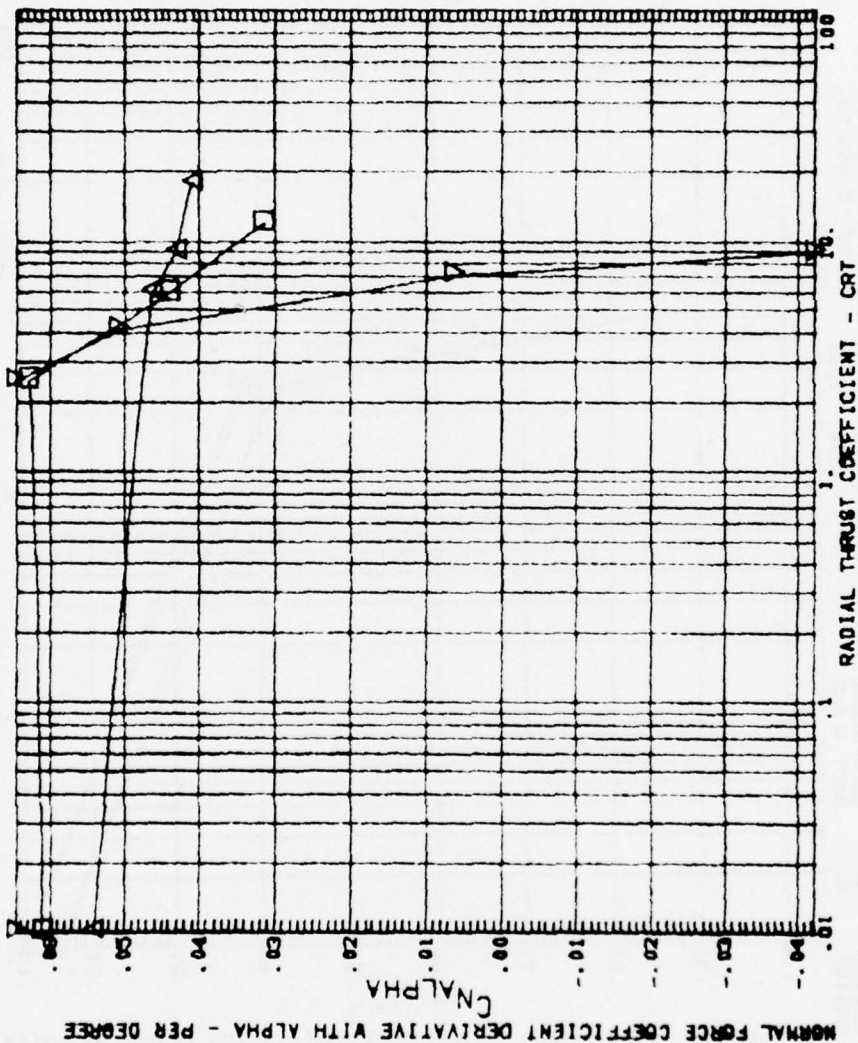
STABILITY DERIVATIVES WITH THRUST EFFECTS BODY ALONE

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
DS0004	△	BODY ALONE	.00	1.10	SREF .050 60. IN.
DS0005	□	BODY ALONE	.00	1.25	LREF 1.100 IN.
DS0006	▽	BODY ALONE	.00	1.35	XWRP 5.830 IN.
DS0007	△	BODY ALONE	.00	1.40	



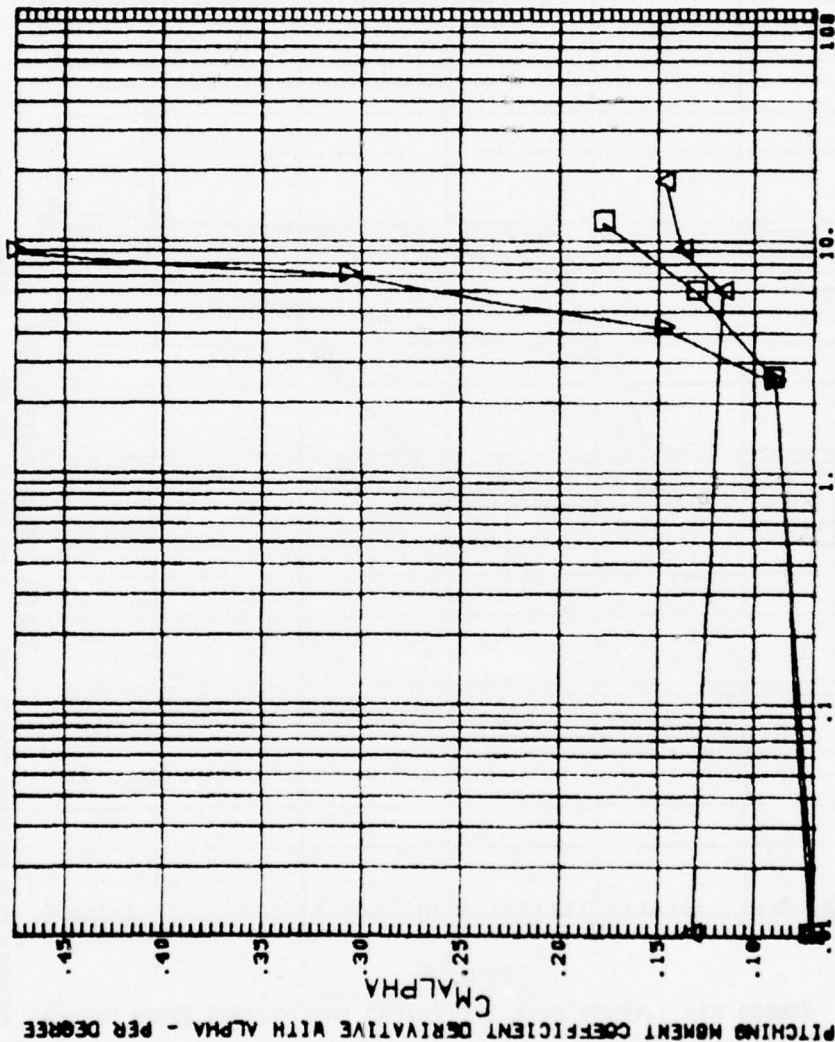
STABILITY DERIVATIVES WITH THRUST EFFECTS BODY ALONE

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0008	△	BODY FLARE	.00	.70	SREF .850 SQ. IN.
BS0009	□	BODY FLARE	.00	1.00	LREF 1.100 IN.
BS0010	▽	BODY FLARE	.00	1.25	XMRP 5.830 IN.



STABILITY DERIVATIVES WITH THRUST EFFECTS BODY FLARE

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0008	△	BODY FLARE	.00	.70	SREF .950 SQ. IN.
BS0009	□	BODY FLARE	.00	1.00	LREF 1.100 IN.
BS0010	▽	BODY FLARE	.00	1.25	XWRP 5.830 IN.

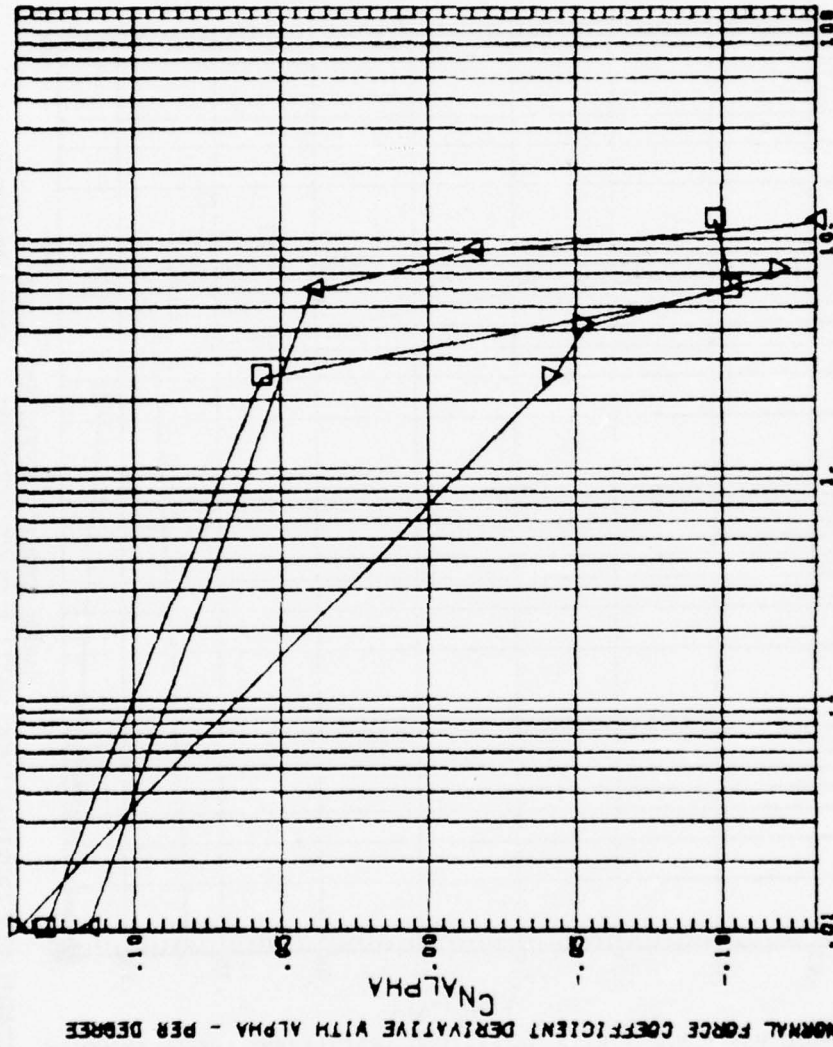


STABILITY DERIVATIVES WITH THRUST EFFECTS BODY FLARE

AEDC TH 830

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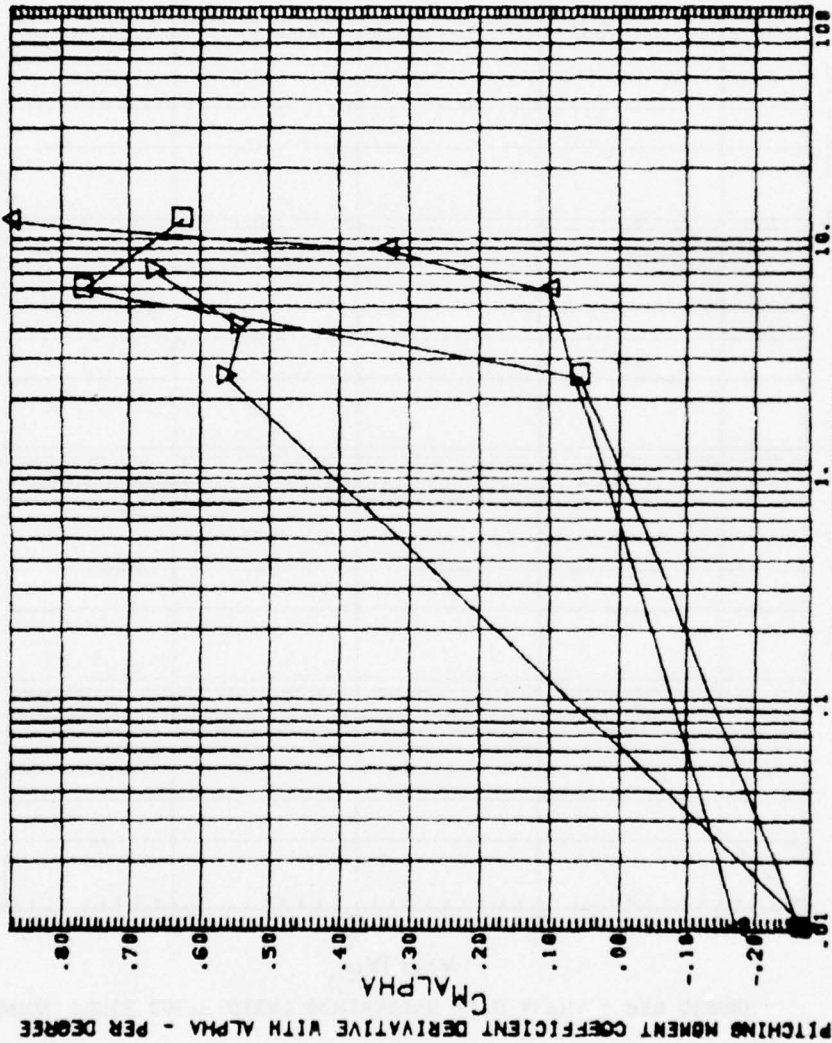
DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
MS0011	Δ	BF2	.00	.70	SREF .950 60 IN.
MS0012	□	BF2	.00	1.00	LREF 1.100 IN.
MS0013	▽	BF2	.00	1.25	XGRP 5.830 IN.



STABILITY DERIVATIVES WITH THRUST EFFECTS BF2

AEDC TM 350

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
060011	Δ	BF2	.00	.70	SREF .950 SQ. IN.
060012	□	BF2	.00	1.00	LREF 1.100 IN.
060013	▽	BF2	.00	1.25	XMRP 5.830 IN.

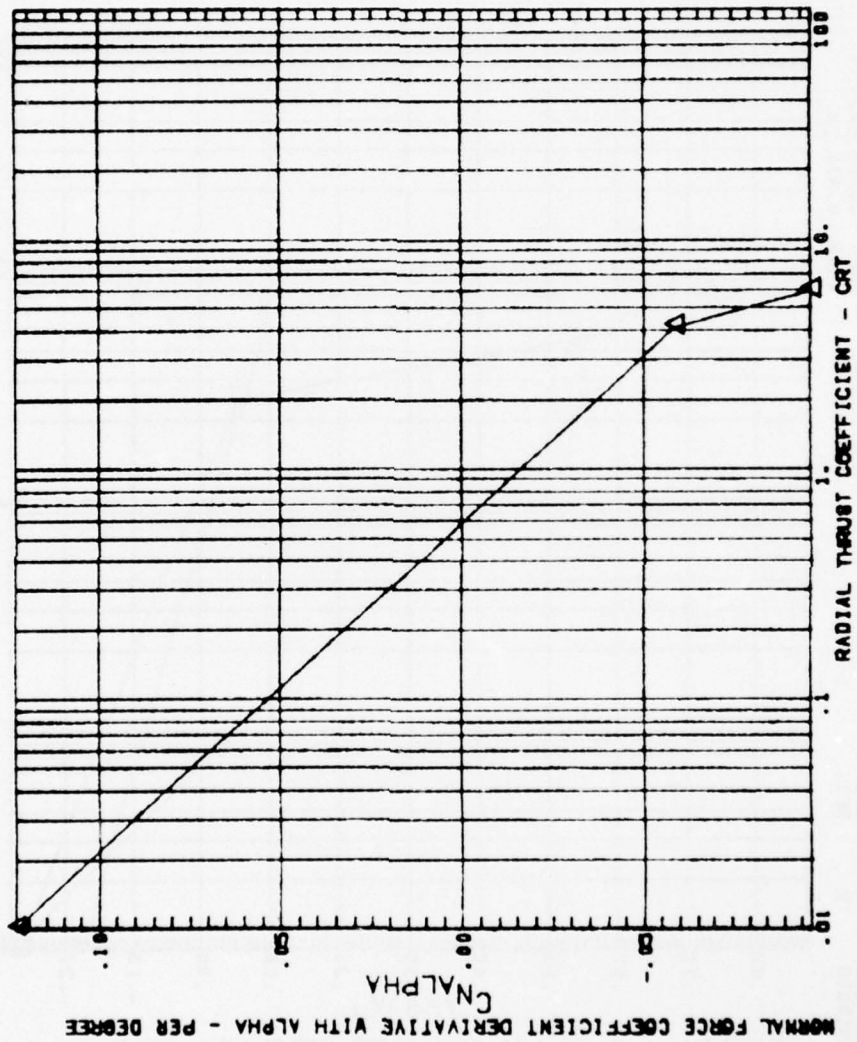


STABILITY DERIVATIVES WITH THRUST EFFECTS BF2

AEDC TM 856

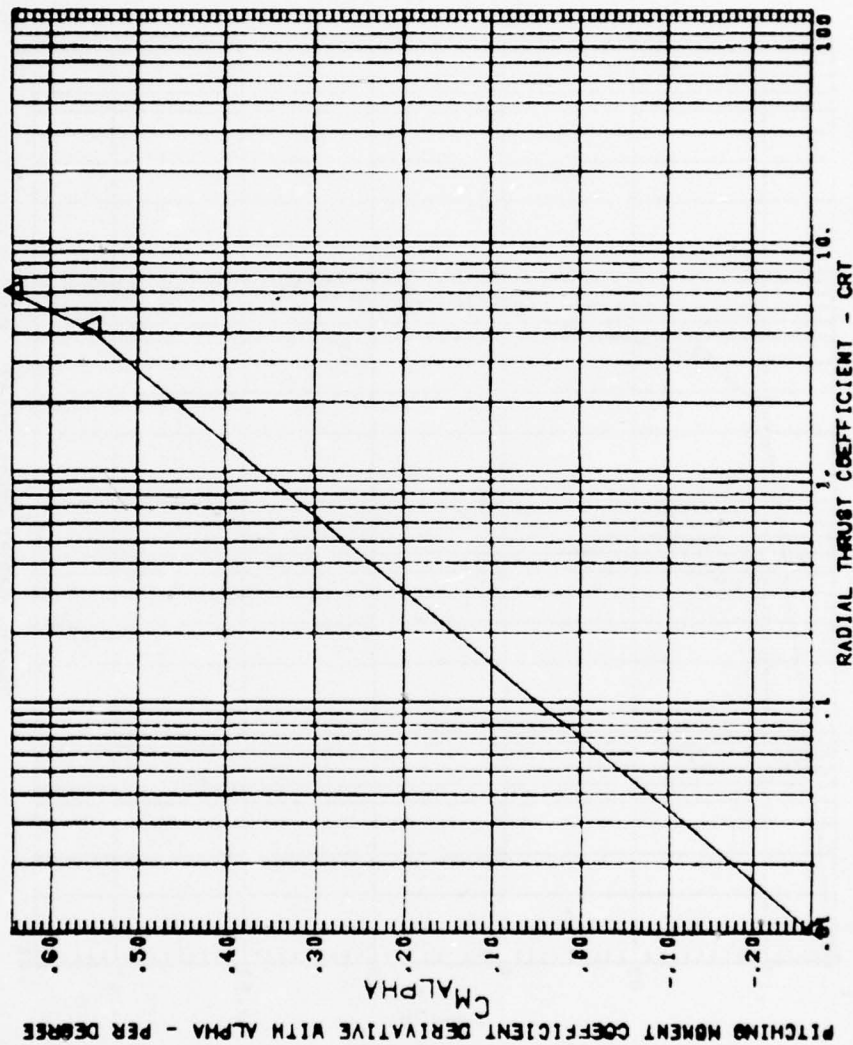
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DATA SET SYMBOL CONFIG DESCRIPTION PHI MACH REFERENCE INFORMATION
 BS0014 Δ BF2. PHI = 45 DEG. 45.00 1.25 SREF .950 SQ. IN.
 LREF 1.100 IN.
 XMRP 5.838 IN.



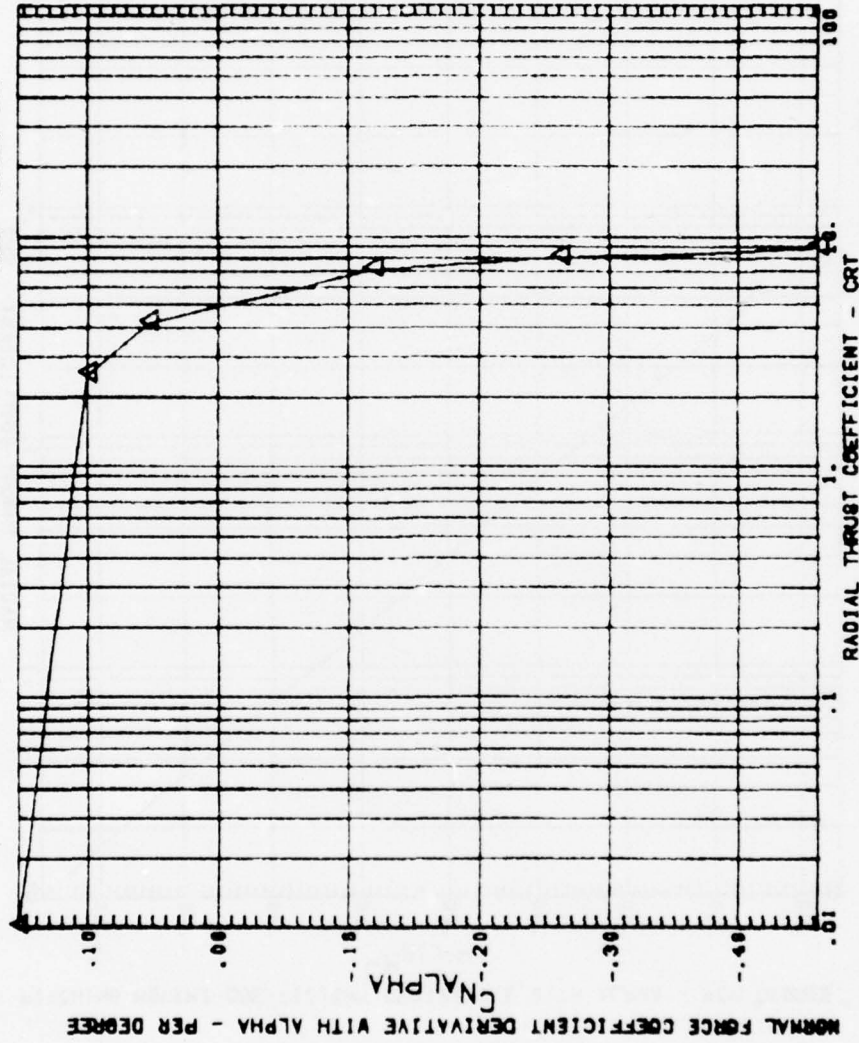
STABILITY DERIVATIVES WITH THRUST EFFECTS BF2. PHI = 45 DEG.

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0014	Δ	BF2, PHI = 45 DEG.	45.00	1.25	SREF .850 60. IN.
					LREF 1.100 IN.
					XGRP 5.830 IN.



STABILITY DERIVATIVES WITH THRUST EFFECTS BF2, PHI = 45 DEG.

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
080015	Δ	BF2 (1.65 FWD)	.00	1.25	SREF .950 SQ. IN.
					LREF 1.100 IN.
					XMRP 5.830 IN.

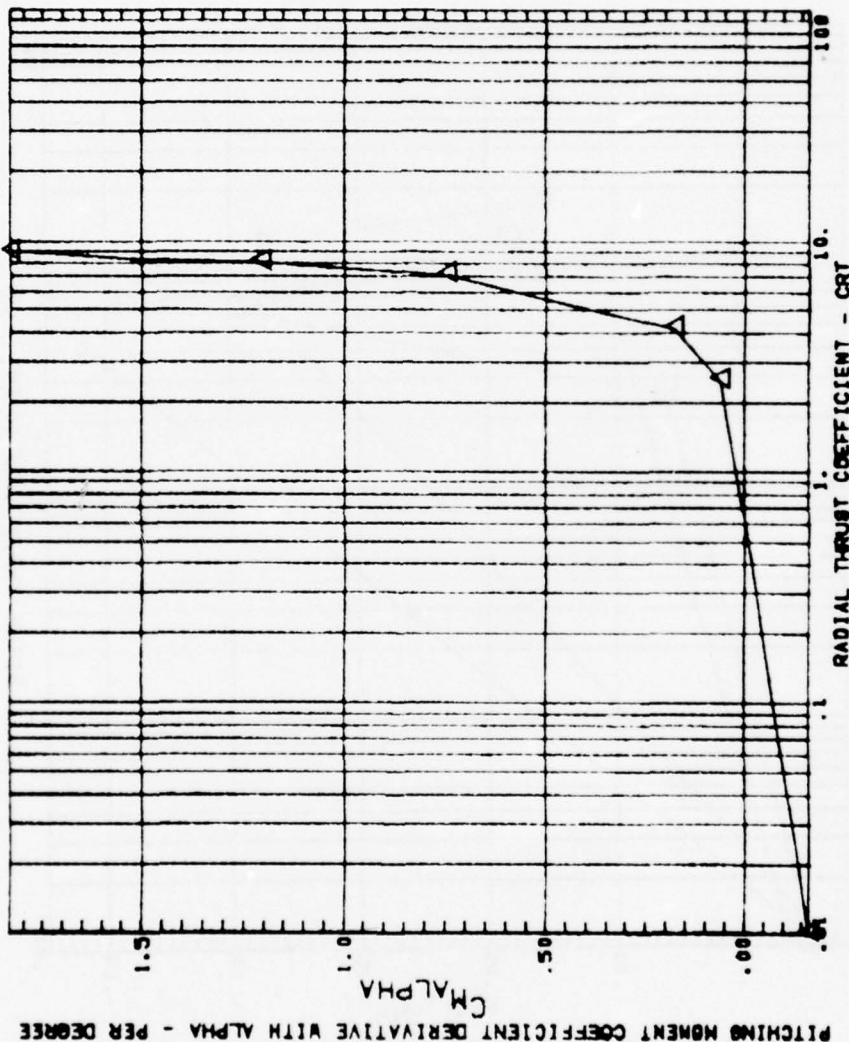


STABILITY DERIVATIVES WITH THRUST EFFECTS BF2 (1.65 FWD)

AEDC TM 850

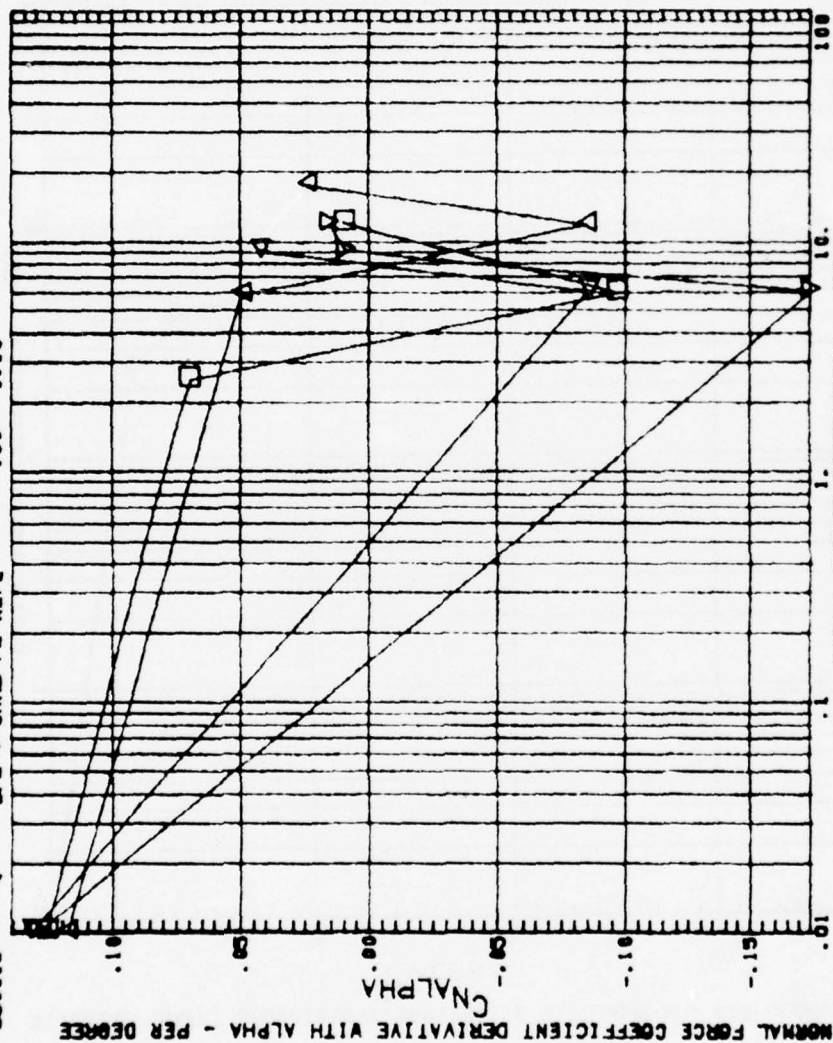
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DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
080013	Δ	BF2 (1.65 FWD)	.00	1.25	SREF .850 50.1M.
					LREF 1.100 1M.
					XMRP 5.830 1M.



STABILITY DERIVATIVES WITH THRUST EFFECTS BF2 (1.65 FWD)

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0016	△	BF2 + GRND PL REFL	.08	.70	SREF .950 SQ. IN.
BS0017	□	BF2 + GRND PL REFL	.08	.90	LREF 1.100 IN.
BS0018	▽	BF2 + GRND PL REFL	.08	1.00	XREF 5.830 IN.
BS0019	△	BF2 + GRND PL REFL	.08	1.10	

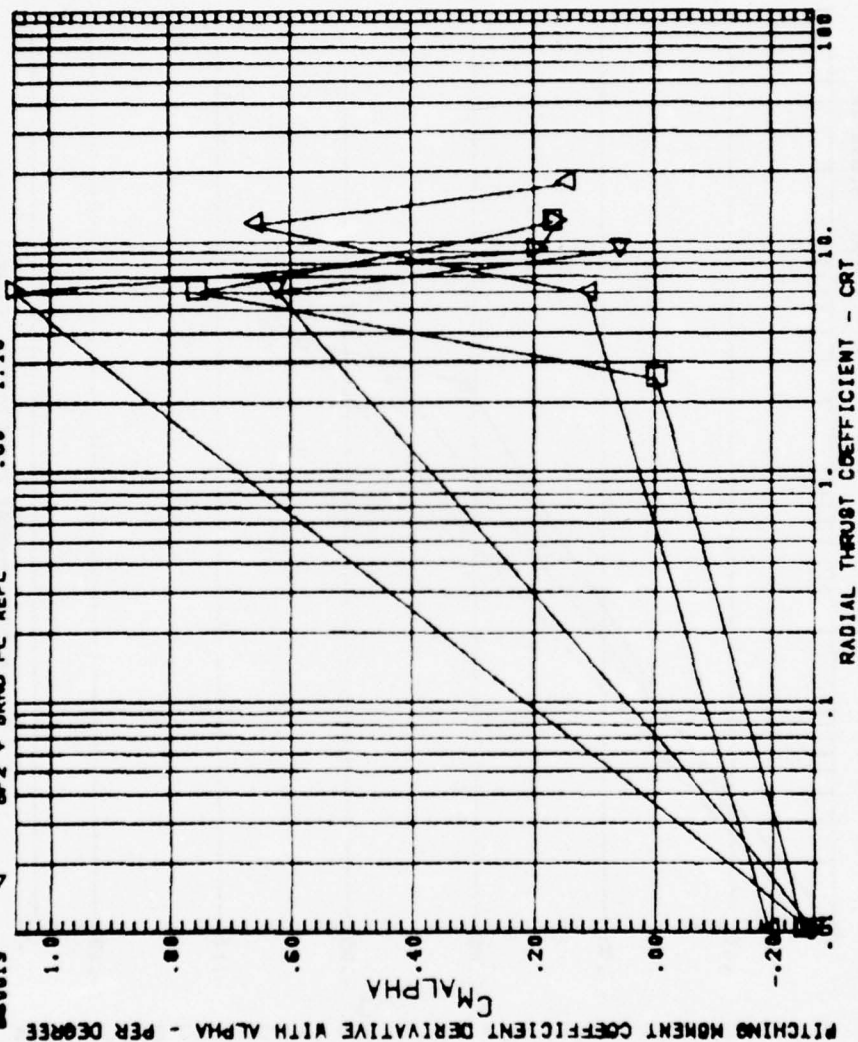


STABILITY DERIVATIVES WITH THRUST EFFECTS BF2 + GRND PL REFL

AEDC TM 850

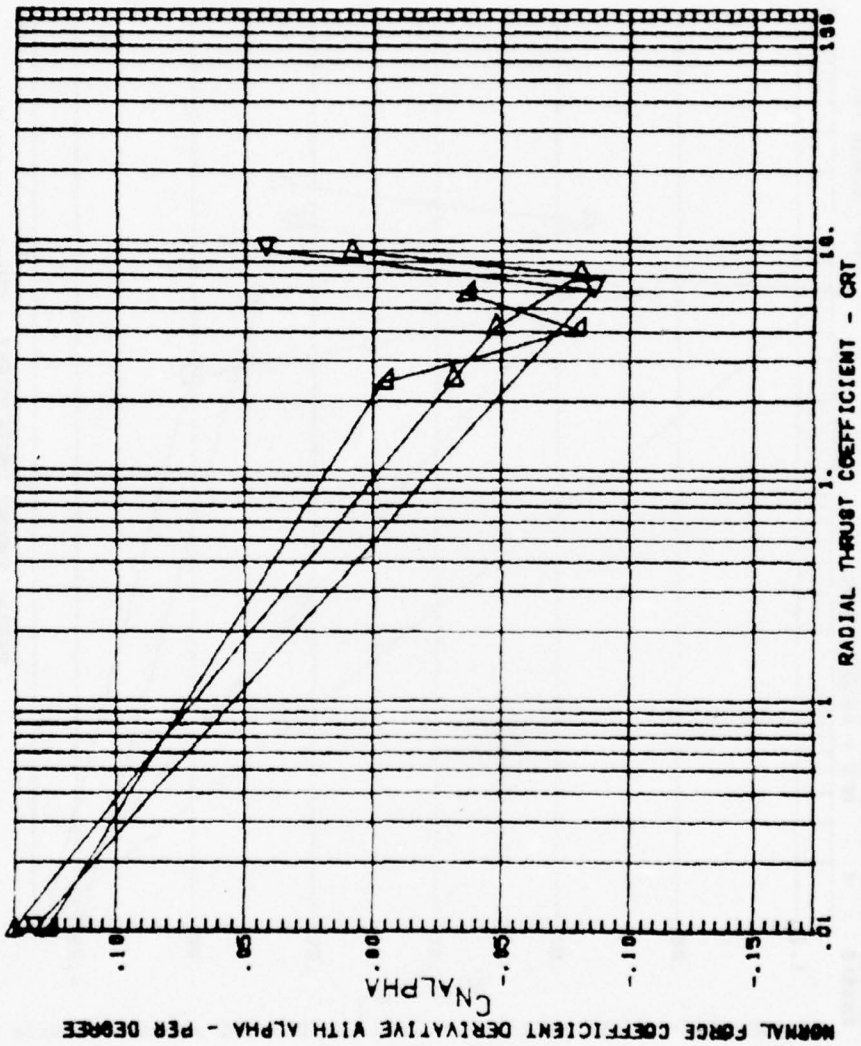
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DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0016	△	BF2 + GRND PL REFL	.00	.70	SREF .950 SO. IN.
BS0017	□	BF2 + GRND PL REFL	.00	.80	LREF 1.100 IN.
BS0018	▽	BF2 + GRND PL REFL	.00	1.00	XWRP 5.830 IN.
BS0019	△	BF2 + GRND PL REFL	.00	1.10	



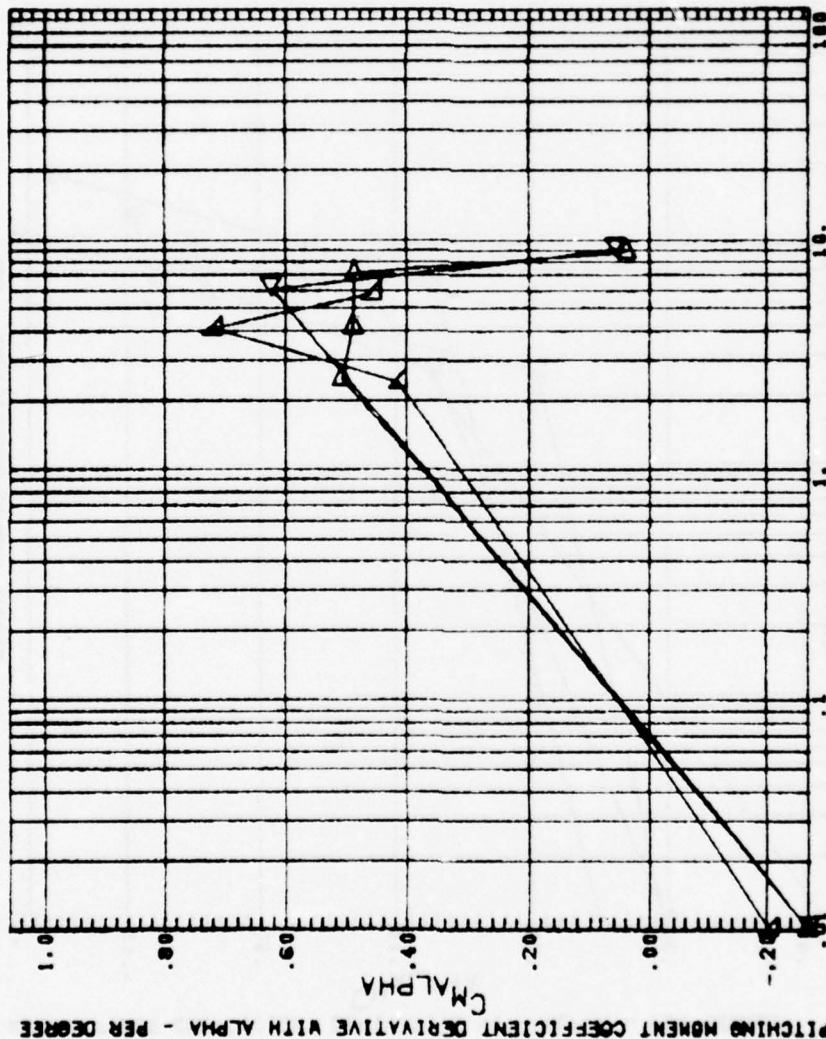
STABILITY DERIVATIVES WITH THRUST EFFECTS BF2 + GRND PL REFL

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
860019	△	BF2 + GRND PL REFL	.00	1.10	SREF .950 SQ. IN.
860020	△	BF2 + GRND PL REFL	.00	1.25	LREF 1.100 IN.
860021	△	BF2 + GRND PL REFL	.00	1.40	XMRP 5.830 IN.



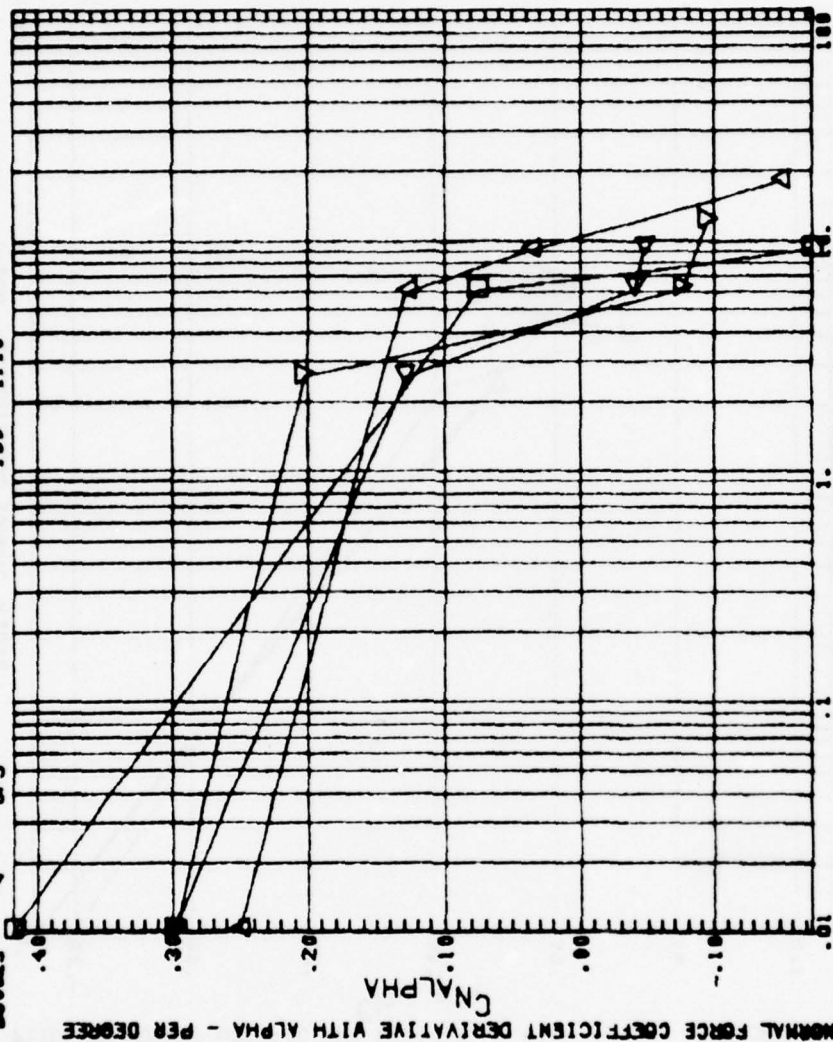
STABILITY DERIVATIVES WITH THRUST EFFECTS BF2 + GRND PL REFL

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0019	△	BF2 + GRND PL REFL	.00	1.10	SREF .950 60. IN.
BS0020	△	BF2 + GRND PL REFL	.00	1.25	LREF 1.100 IN.
BS0021	△	BF2 + GRND PL REFL	.00	1.40	XORP 5.030 IN.



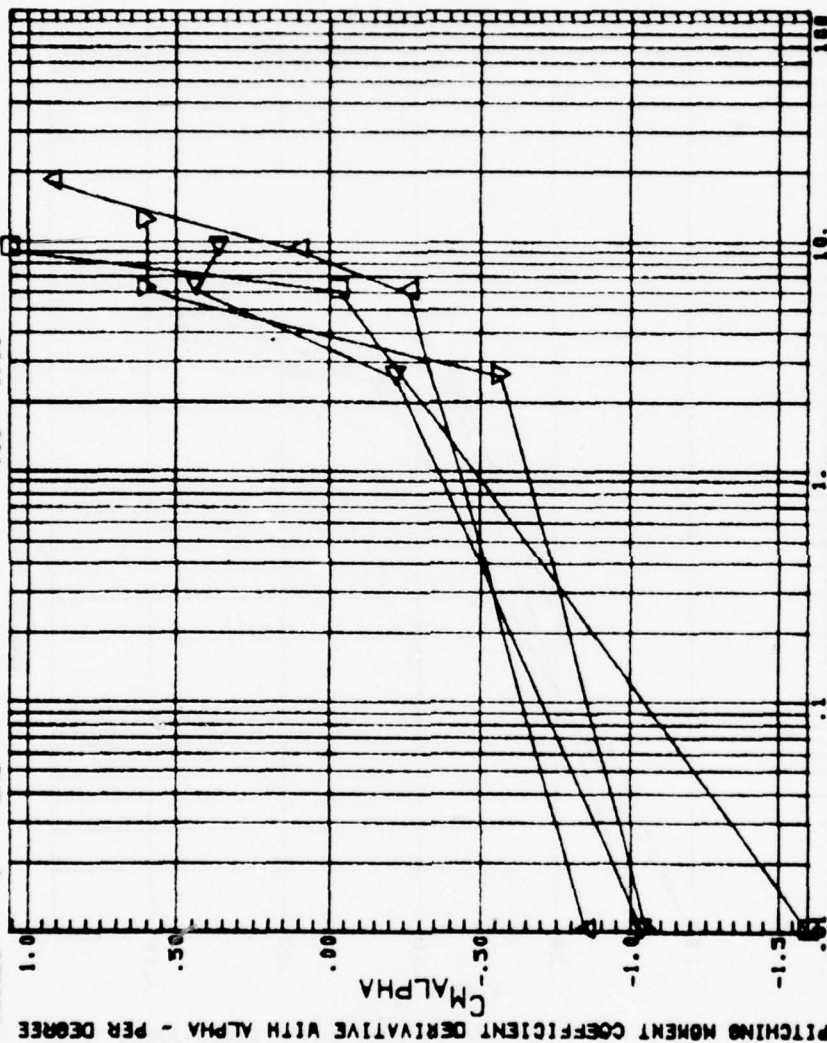
STABILITY DERIVATIVES WITH THRUST EFFECTS BF2 + GRND PL REFL

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
060022	Δ	BF5	.00	.70	SREF .950 60. IN.
060023	□	BF5	.00	.80	LREF 1.100 IN.
060024	Δ	BF5	.00	1.00	XMRP 5.830 IN.
060025	Δ	BF5	.00	1.10	



STABILITY DERIVATIVES WITH THRUST EFFECTS BF5

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
860022	△	BF3	.08	.70	SREF .950 SQ. IN.
860023	□	BF3	.08	.80	LREF 1.100 IN.
860024	△	BF3	.08	1.00	XREF 5.830 IN.
860025	△	BF3	.08	1.10	

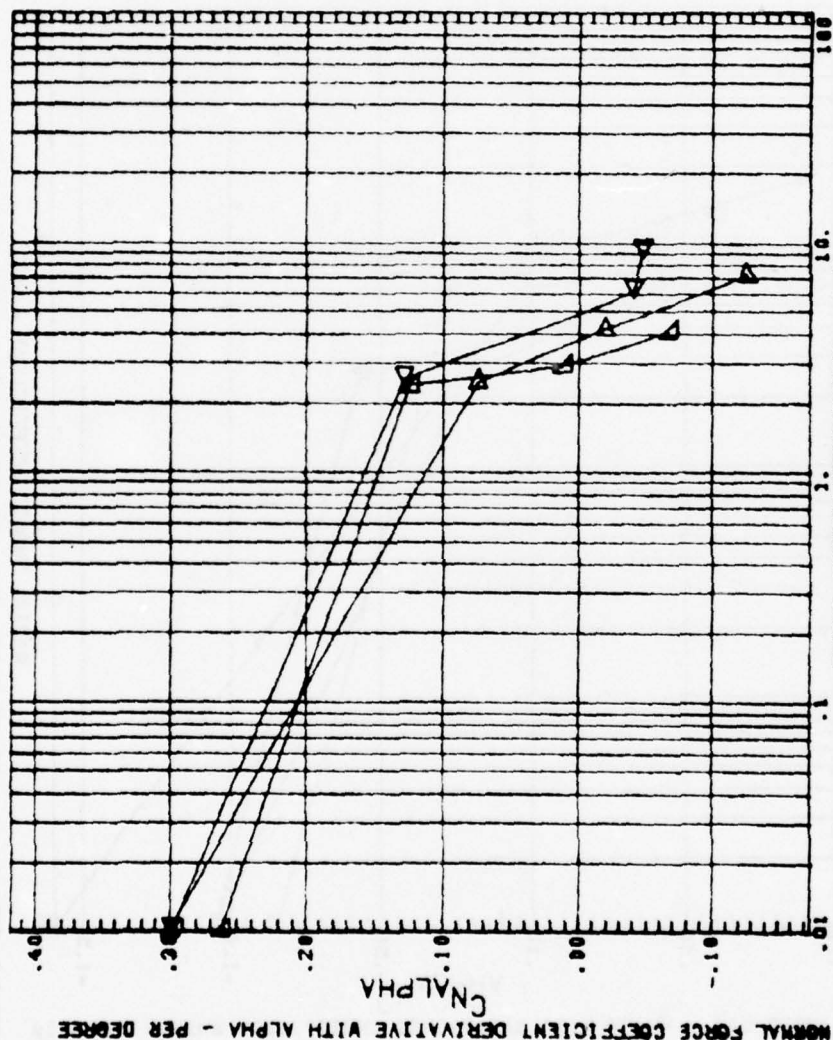


STABILITY DERIVATIVES WITH THRUST EFFECTS BF3

AEDC TM 830

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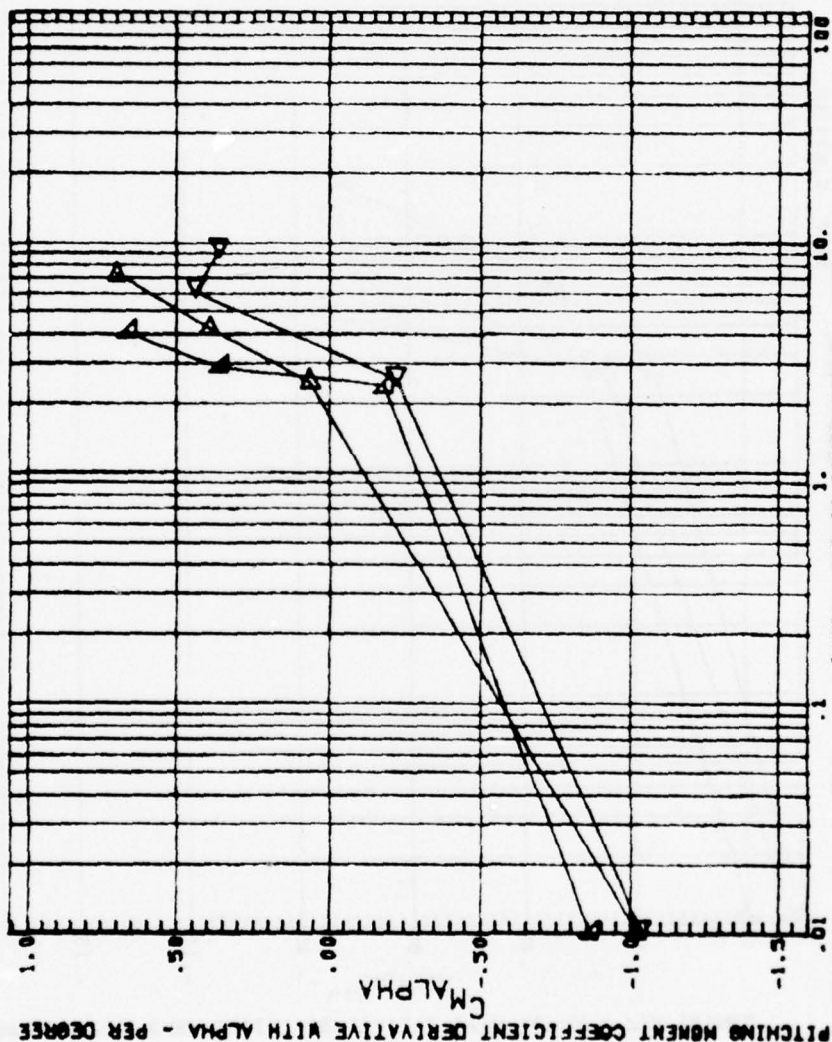
DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
050025	△	BF5	.00	1.10	SREF .850 60 IN.
050026	△	BF5	.00	1.25	LREF 1.100 IN.
050027	△	BF5	.00	1.40	XREF 5.830 IN.



STABILITY DERIVATIVES WITH THRUST EFFECTS BF5

AEDC TM 830

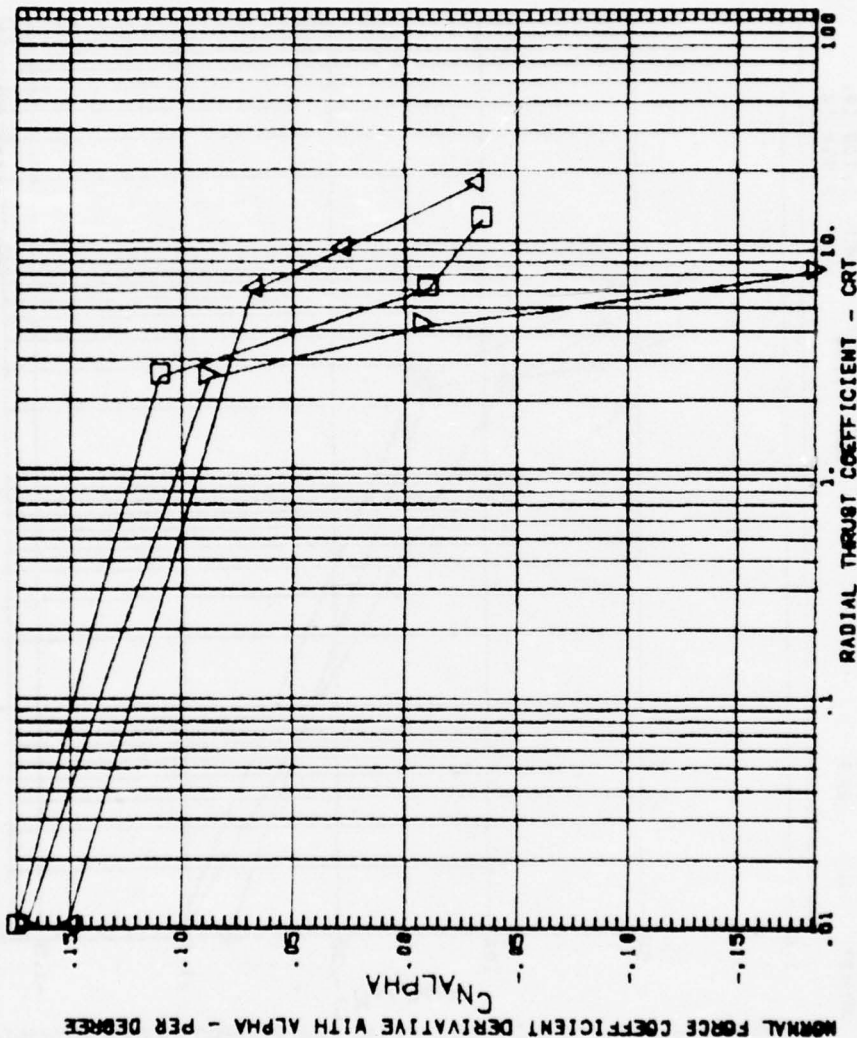
DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
060025	△	BF5	.00	1.10	SREF .950 SQ. IN.
060026	△	BF5	.00	1.25	LREF 1.100 IN.
060027	△	BF5	.00	1.40	XREF 5.830 IN.



STABILITY DERIVATIVES WITH THRUST EFFECTS BF5

AEDC TM 850

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
060020	△	BF6	.00	.70	SREF .850 SQ. IN.
060020	□	BF6	.00	1.00	LREF 1.100 IN.
060030	▽	BF6	.00	1.25	XREF 5.830 IN.

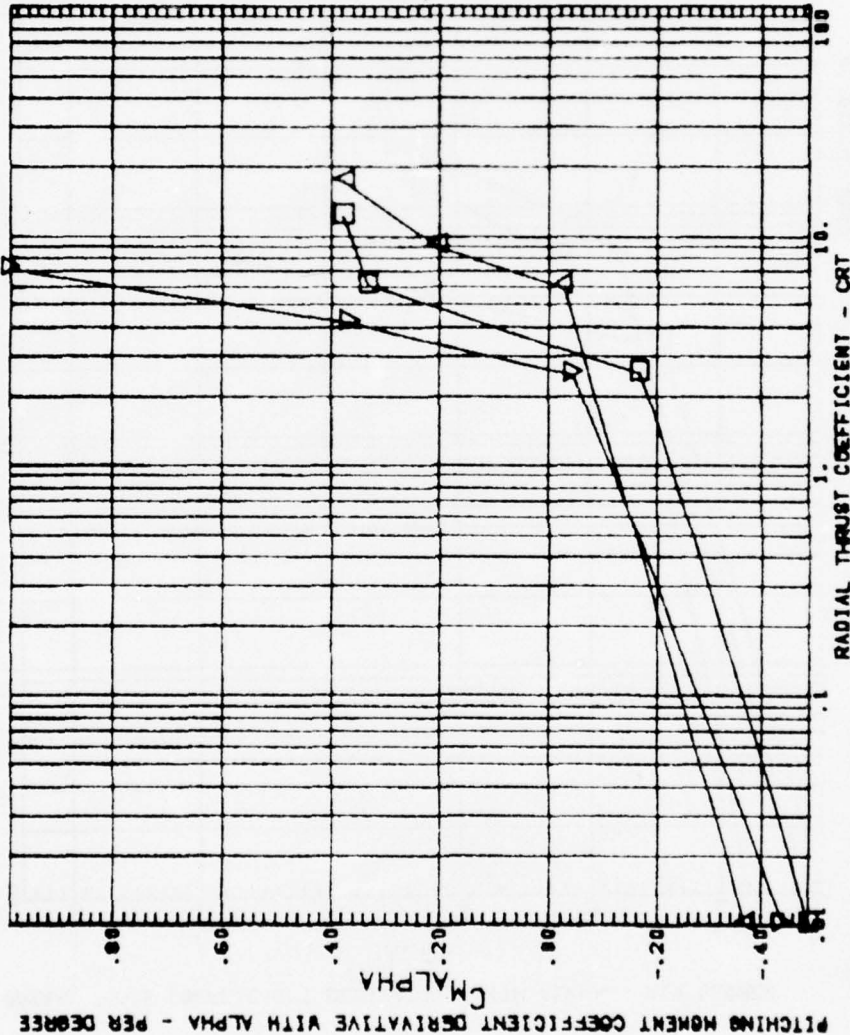


STABILITY DERIVATIVES WITH THRUST EFFECTS BF6

AEDC TM 250

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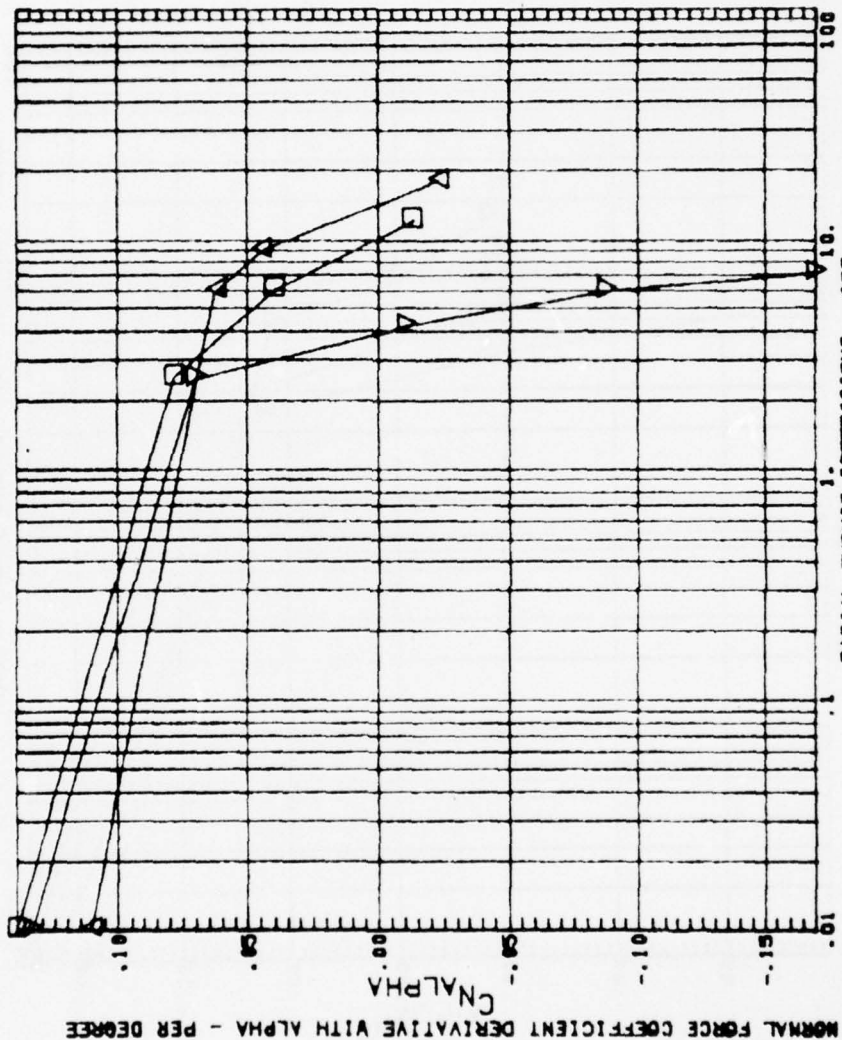
DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0028	Δ	BF6	.00	.70	SREF .950 SB.IN.
BS0029	□	BF6	.00	1.00	LREF 1.100 IN.
BS0030	▽	BF6	.00	1.25	XWRP 5.838 IN.



STABILITY DERIVATIVES WITH THRUST EFFECTS BF6

AEDC TH 830

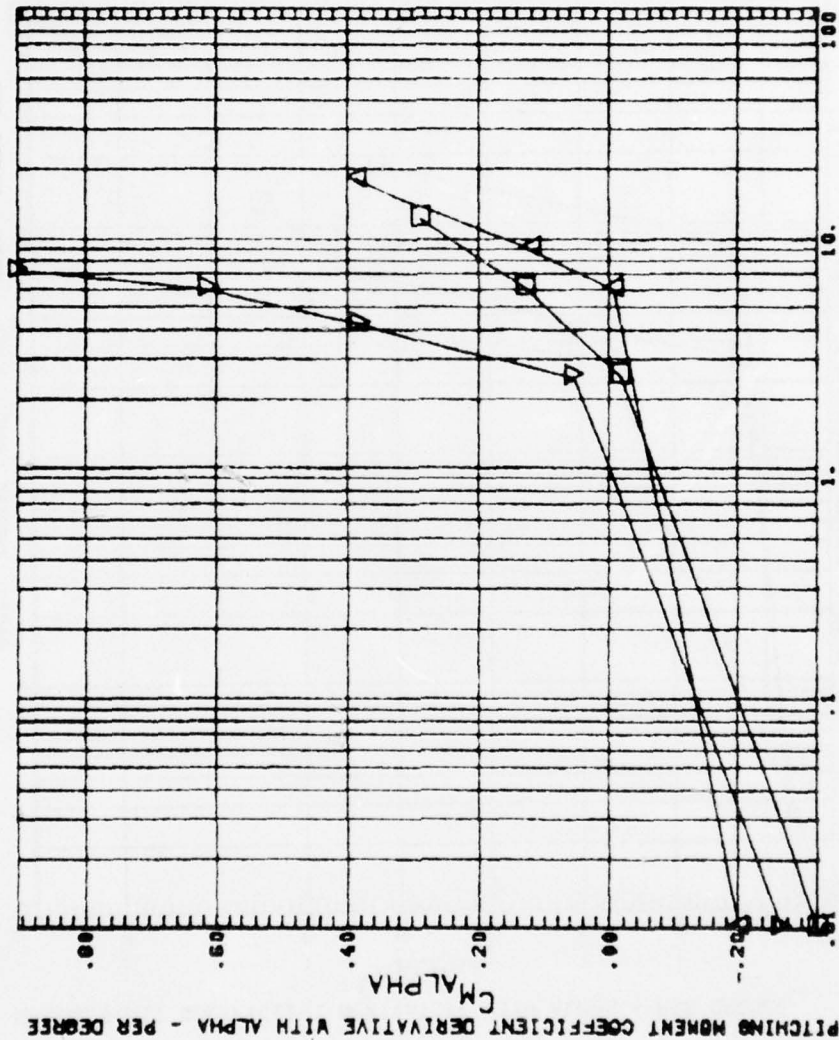
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BS0032	□	BF7	-00	1.00	LREF 1.100 IN.
BS0033	△	BF7	-00	1.25	XGRP 5.838 IN.



STABILITY DERIVATIVES WITH THRUST EFFECTS BF7

AEDC TM 850

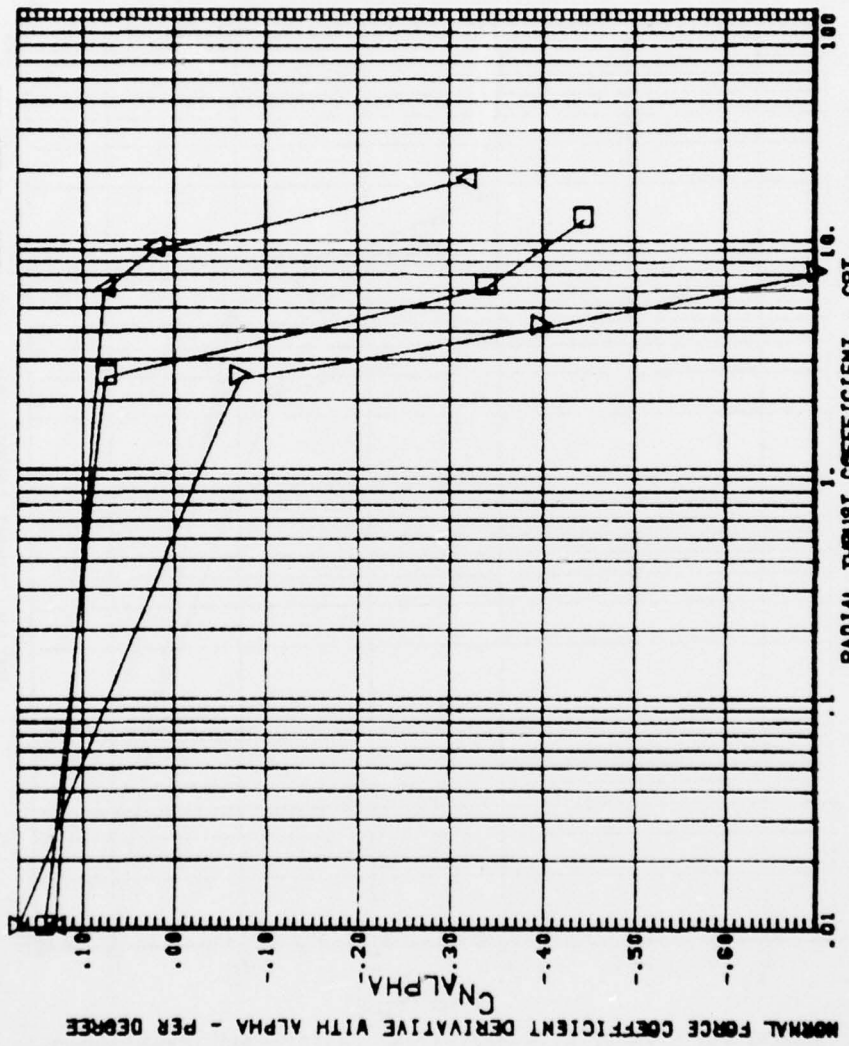
DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0031	△	BF7	.00	.70	SREF .950 SQ. IN.
BS0032	□	BF7	.00	1.00	LREF 1.100 IN.
BS0033	▽	BF7	.00	1.25	XGRP 5.838 IN.



STABILITY DERIVATIVES WITH THRUST EFFECTS BF7

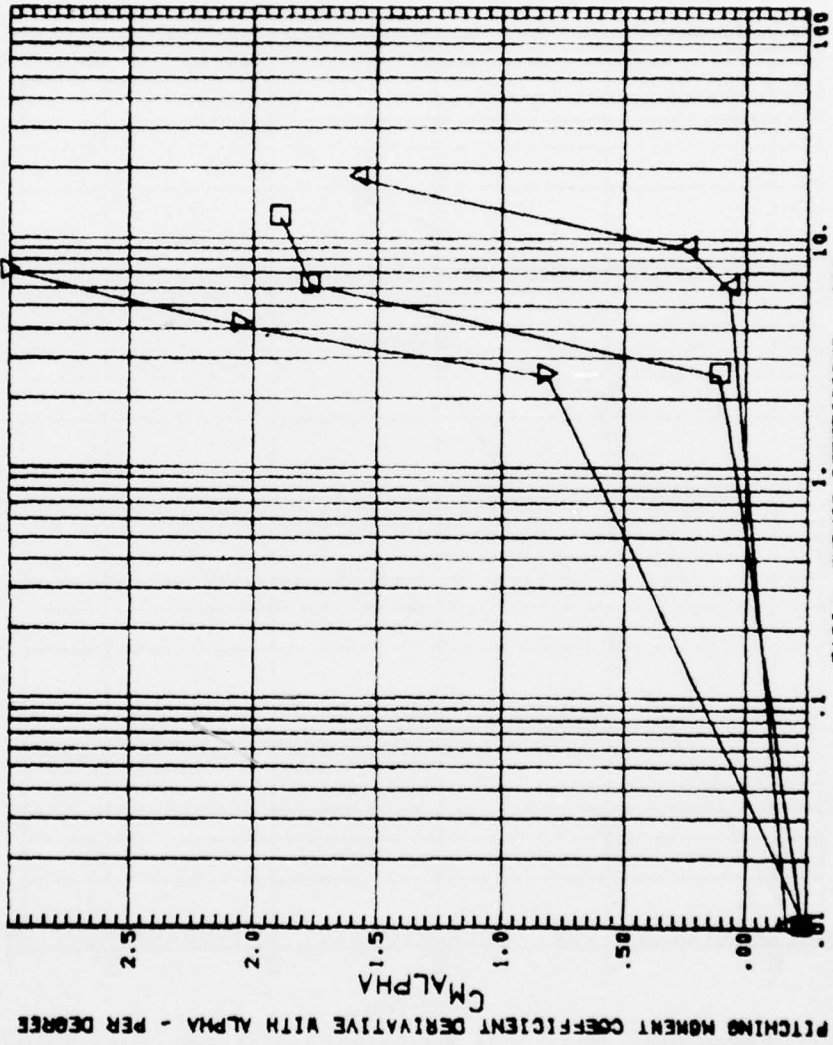
AEDC TM 898

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0034	△	BF8	.00	.70	SRF .950 SQ. IN.
BS0035	□	BF8	.00	1.00	LREF 1.100 IN.
BS0036	▽	BF8	.00	1.25	XGRP 5.830 IN.



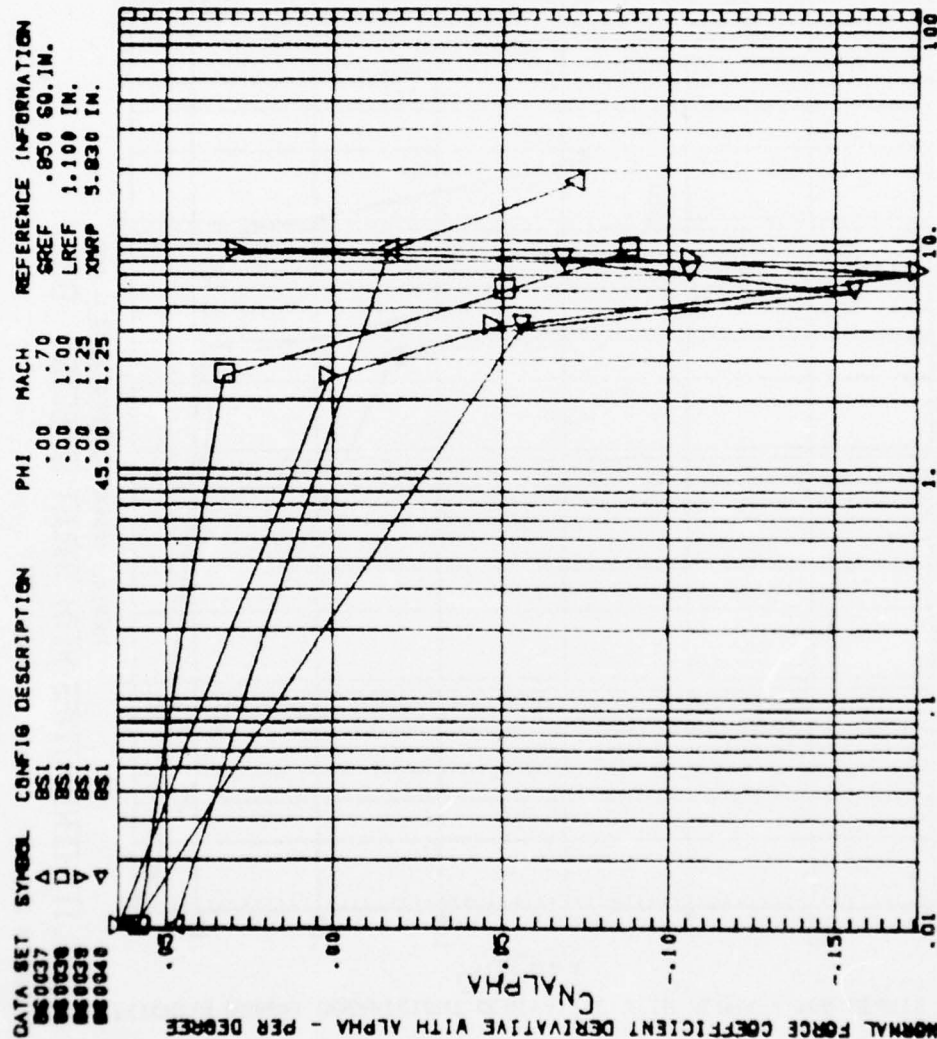
STABILITY DERIVATIVES WITH THRUST EFFECTS BF8

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0034	Δ	BF8	.00	.70	SREF .850 SQ. IN.
BS0035	□	BF8	.00	1.00	LREF 1.100 IN.
BS0036	▽	BF8	.00	1.25	XREF 5.830 IN.



STABILITY DERIVATIVES WITH THRUST EFFECTS BF8

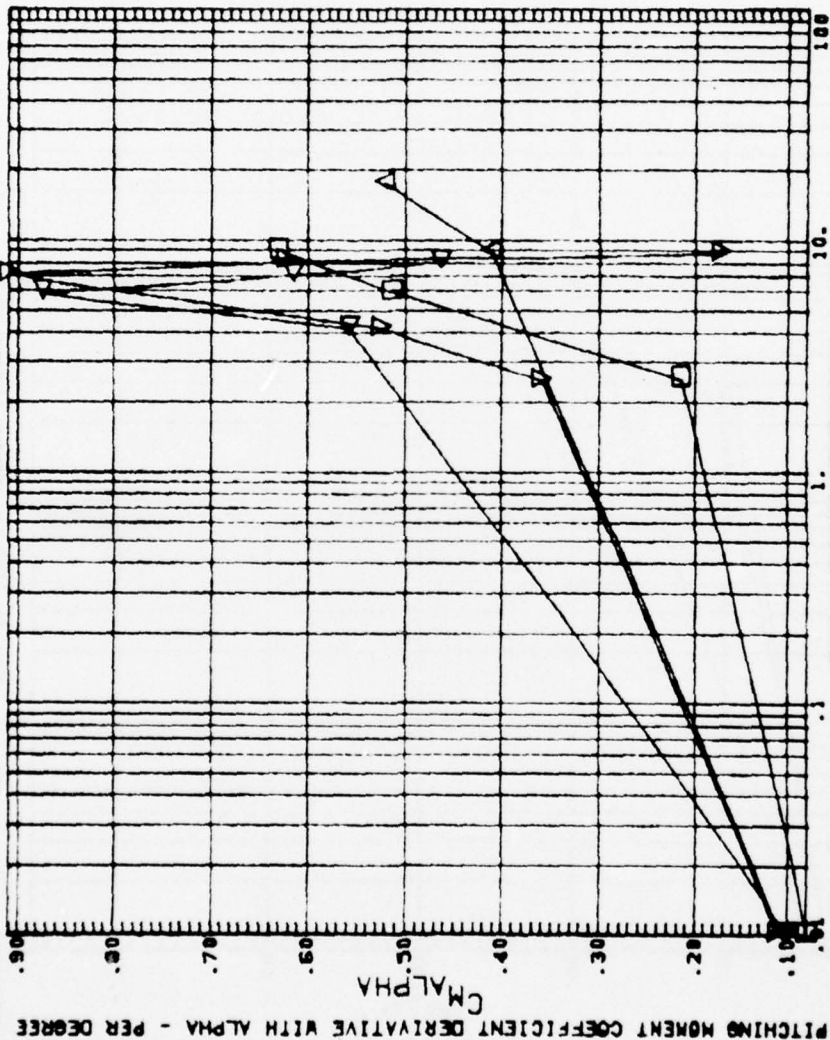
AEDC TM 838



STABILITY DERIVATIVES WITH THRUST EFFECTS BS1

AEDC TM 358

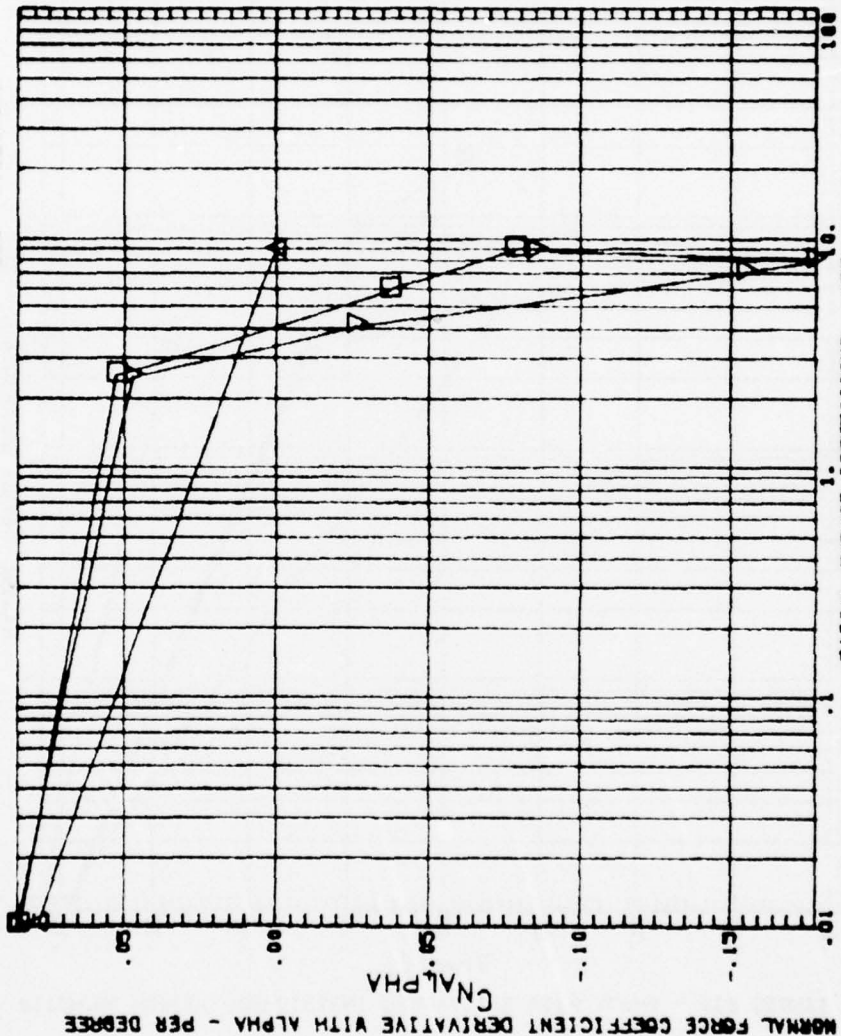
DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0037	Δ	BS1	.00	.70	SREF .850 SQ. IN.
BS0038	□	BS1	.00	1.00	LREF 1.100 IN.
BS0039	Δ	BS1	.00	1.25	XMRP 5.830 IN.
BS0040	Δ	BS1	45.00	1.25	



STABILITY DERIVATIVES WITH THRUST EFFECTS BS1

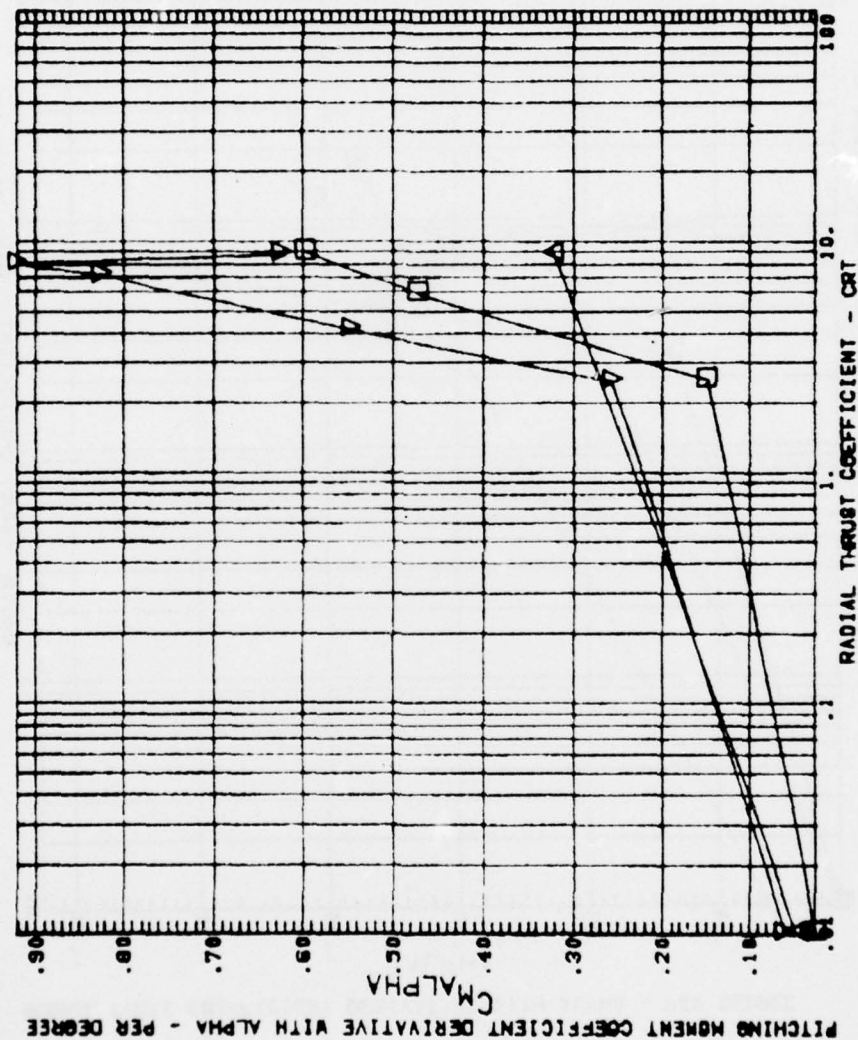
AEDC TM 830

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0041	△	BS2	.00	.70	SREF .050 SQ. IN.
BS0042	□	BS2	.00	1.00	LREF 1.100 IN.
BS0043	▽	BS2	.00	1.25	XREF 5.030 IN.



STABILITY DERIVATIVES WITH THRUST EFFECTS BS2

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0041	△	BS2	.00	.70	SREF .950 SQ. IN.
BS0042	□	BS2	.00	1.00	LREF 1.100 IN.
BS0043	▽	BS2	.00	1.25	XWRP 5.938 IN.



PITCHING MOMENT COEFFICIENT DERIVATIVE WITH ALPHA - PER DEGREE

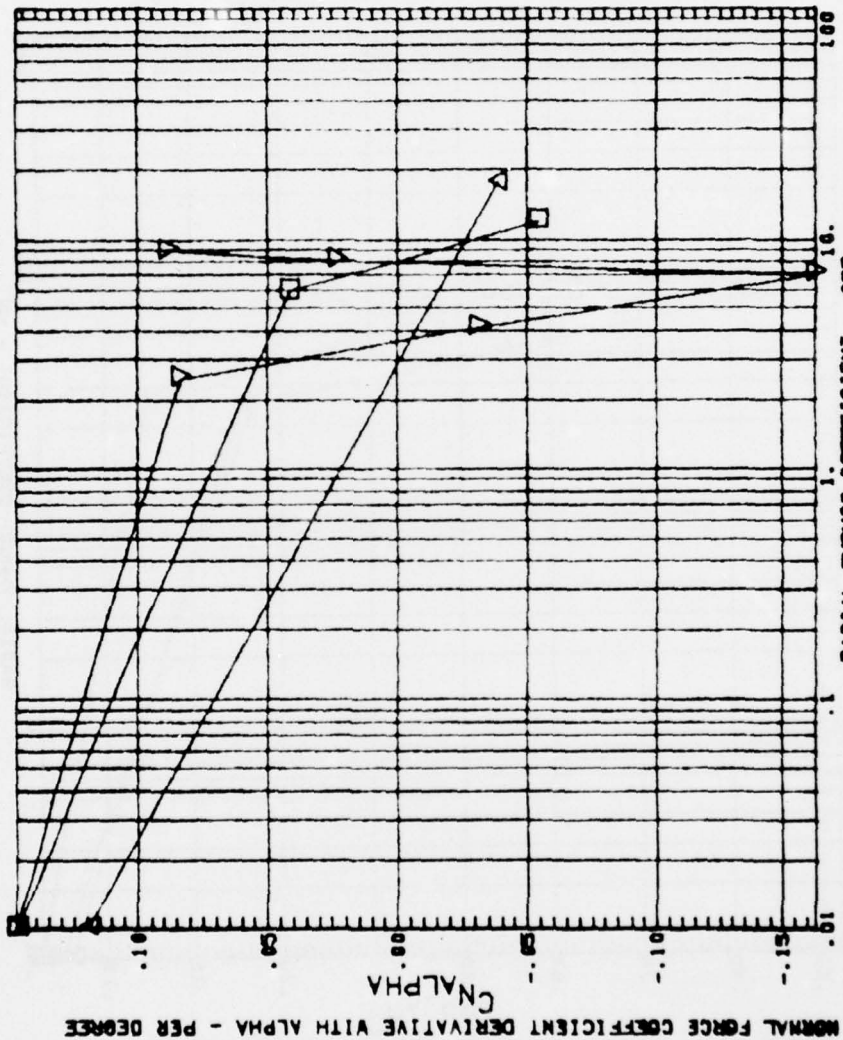
RADIAL THRUST COEFFICIENT - CRT

STABILITY DERIVATIVES WITH THRUST EFFECTS BS2

AEDC TH 830

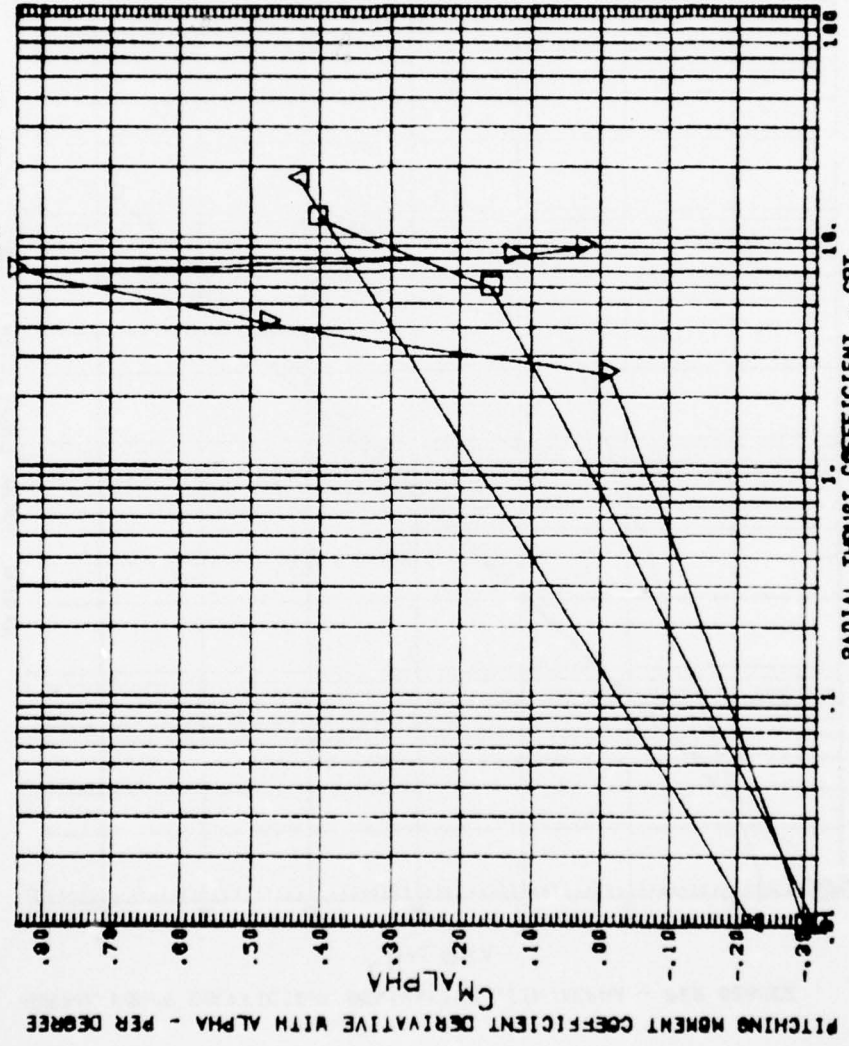
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DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0044	Δ	BF751	.08	.70	SREF .950 SQ. IN.
BS0045	□	BF751	.08	1.00	LREF 1.100 IN.
BS0046	▽	BF751	.08	1.25	XREF 5.630 IN.



STABILITY DERIVATIVES WITH THRUST EFFECTS BF751

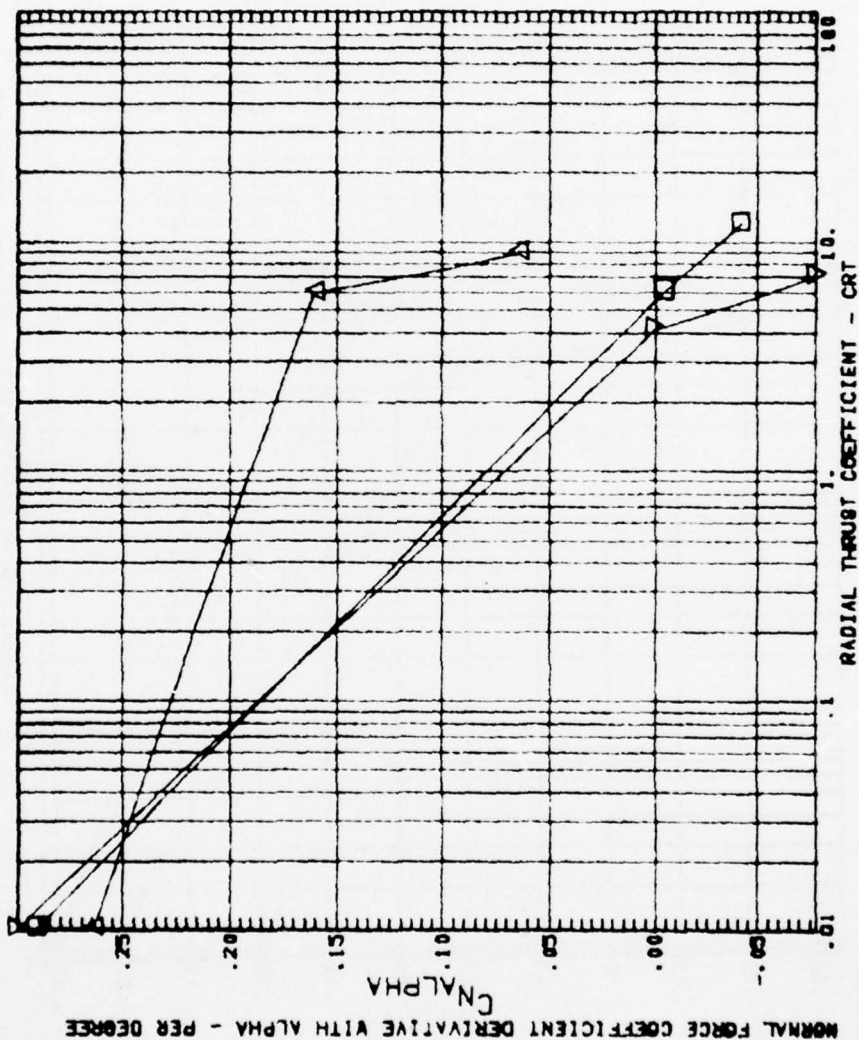
DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
860044	△	BF7S1	.00	.70	SREF .850 SQ. IN.
860045	□	BF7S1	.00	1.00	LREF 1.100 IN.
860046	▽	BF7S1	.00	1.25	XMRP 5.830 IN.



PITCHING MOMENT COEFFICIENT DERIVATIVE WITH ALPHA - PER DEGREE

STABILITY DERIVATIVES WITH THRUST EFFECTS BF7S1

DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
060047	△	BF551	.00	.70	SREF .950 SQ. IN.
060048	□	BF551	.00	1.00	LREF 1.100 IN.
060049	▽	BF551	.00	1.25	XMRP 5.838 IN.

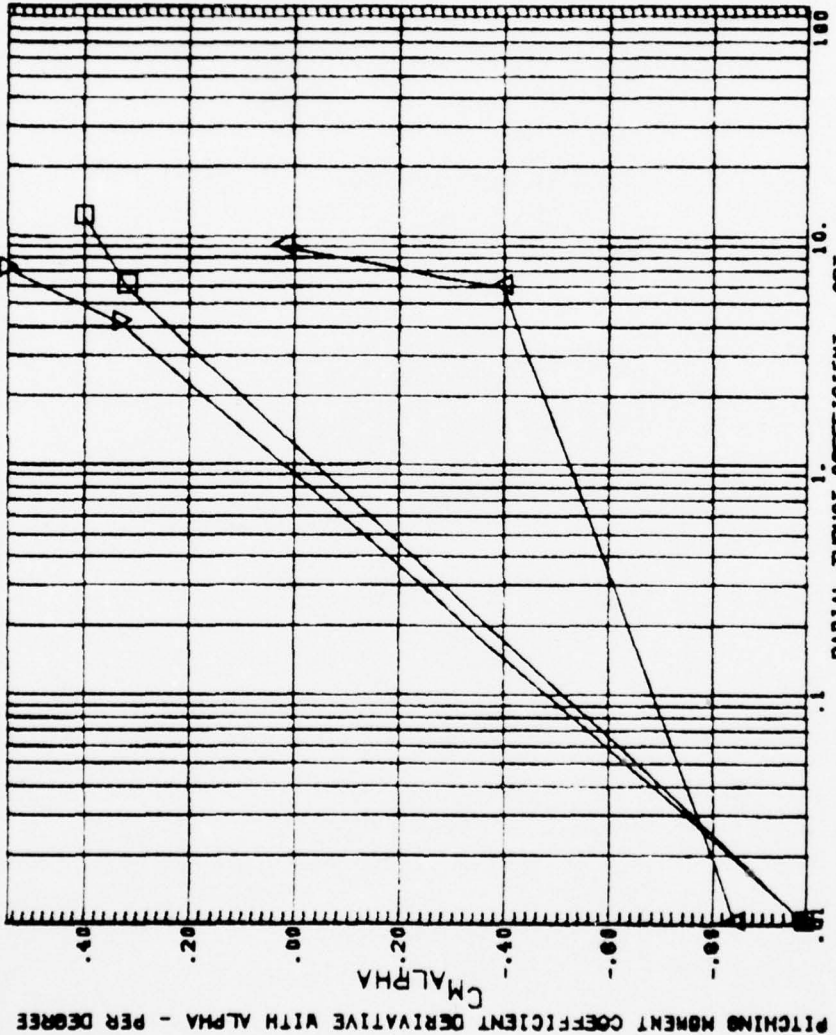


STABILITY DERIVATIVES WITH THRUST EFFECTS BF551

AEDC TM 850

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DATA SET	SYMBOL	CONFIG DESCRIPTION	PHI	MACH	REFERENCE INFORMATION
BS0047	Δ	BF551	.00	.70	SREF .950 SQ. IN.
BS0048	□	BF551	.00	1.00	LREF 1.100 IN.
BS0049	▽	BF551	.00	1.25	XWRP 5.838 IN.



STABILITY DERIVATIVES WITH THRUST EFFECTS BF551

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